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THE ACADEMIC ASPECT OF MEDICAL EDUCATION.[1]

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IT has been said that the problem of medical education is a problem of education, not of medicine. That might be interpreted to mean, broadly, that while there is no great difficulty in instructing people in the known techniques of medical practice, there is a very serious difficulty in educating them to the point of realizing that there are even more important things they should aspire to. These are, on the one hand, an appreciation of the value of other branches of learning in the production of a properly balanced member of the community; and on the other hand an active awareness of the historical, social and scientific background to the practice of medicine. This offers the only prospect of advancing medical knowledge as opposed to mere refinement in practical techniques. Medical education in this fuller sense has a general educational value as great as that of any other intellectual discipline.

It is undoubtedly true that the doctor's job is to detect, diagnose and treat physical ills. But if it is held that such work is the sole end of medical education, then doctors can scarcely complain if they are grouped educationally with motor mechanics and plumbers, for the average practitioner plays as little part in the advancement of medicine as the average motor mechanic does in the advancement of motor engineering. This brings up the whole problem of the relationship of academic and practical medicine, and the matter can be set in its proper perspective only by some consideration of the history of that relationship.

The ancient medicine of, say, Egypt and Babylonia was mostly taught by priests in ecclesiastical institutions. Then, as now, academic theory provided the basis of instruction, and some practice was taught from experience with living patients. In those times the theoretical basis was determined mainly by magic, astrology and the dogmas of the particular religion in power. The practice was correspondingly irrational and poor, but it was relieved here and there by empirical procedures learnt in the hard school of trial and error.

In the world of Greek thought, however, religion and magic played a much smaller part in medical theory, and after about 500 B.C. a really scientific attitude developed. This was based upon a growing tendency to reject traditional beliefs in favour of direct appeal to Nature for information. Thus was built up a body of factual observations, from which general principles could be extracted to provide a more enduring foundation for medical practice. Such principles as those contained in the writings of the Hippocratic school of Cos, for example, are as modern as anything today in their interpretation of clinical observations, and many are still valid. The fact that the Greeks drew many false inferences does not detract from their merit, for probably as many false inferences are drawn nowadays, and from much better data than the Greeks could ever dream of. The virtue of the Greeks lay in their scientific approach towards the acquisition of knowledge: on this they established a more substantial medical theory than any known up to that time. The Greek doctors were

[1] Read at a meeting of the South Australian Branch of the British Medical Association on March 29, 1951.

the best of the ancient world, they constituted the whole effective medical profession of the Roman Empire, and their fame extended well into the Christian era.

Early Christian medical theory crystallized around the writings of Aristotle and Galen, but practice was scarcely fostered by an outlook which taught that man's only happiness lay in freeing his soul from its earthly clay as soon as possible. Thus ensued a stasis in theory and deterioration in practice. In the seventh century A.D. the faith of Islam arose and spread, engulfing many great cities with their excellent libraries of Greek works. The Moslems cherished those writings and had them translated into Arabic. This body of Greek learning provided the foundation and most of the substance of the Arabic schools of medicine which flourished under various caliphates, from Persia in the east to Spain in the west. The religion of the Arabs, however, forbade dissection of humans or depiction of the human body, so there was no recourse to facts and little was added to medical knowledge. In general the Arabs preserved a reasonable practice based upon the empiricism of the Greeks.

Systematic medical teaching did not appear in Christian Europe until about A.D. 1000, with the establishment of the famous school at Salerno. Salerno, however, lived entirely upon Greek lore borrowed from the Arabs, and when such schools as Bologna and Padua developed an urge to appeal directly to Nature once more, Salerno suffered an eclipse from which it never recovered.

The revival of learning in Europe got under way with rediscovery of the original Greek writings and appreciation of the Greek method of direct observation. Medicine lagged behind other branches of learning in this respect. Vesalius published his "*De fabrica*" in 1543, but the medical renaissance cannot be considered properly launched until 1628 when Harvey published his "*De motu cordis*". From that time the scientific method gradually but progressively displaced the appeal to authority. The method has gained continuous momentum, so that now we have accumulated a mass of knowledge which is becoming a positive embarrassment—but it is real knowledge, gained by observation of facts rather than from authority. Despite some surviving adherence to an ecclesiastical atmosphere and pontifical pronouncements, there is little doubt that medical practice has never stood higher than it does today.

I do not propose to elaborate this historical survey beyond the point where it serves my present purpose, which is to illustrate the dependence of practice upon theory. Even this cursory glimpse, however, shows that practice rises and falls with theory. Bad theory, dependent upon magic, religious dogma or mere authority, breeds bad practice; good theory, derived from observation of facts, supports good practice. Nevertheless, it is not uncommon to hear a doctor, sometimes one who occupies a position of respect, assert that he is a practical man with no time for theories. He fails to realize that his practice is based upon theories elaborated by his predecessors; and certainly he would not recognize the fact that his distaste for theories is really a confession of his inability to adapt himself mentally to changing points of view. He is, indeed, in precisely the same position as the man who says "what was good enough for my grandfather and my father is good enough for me". Thomas Henry Huxley once said that "the practical man is the man who practises the errors of his forefathers"; that is, he prefers to stick to what he knows rather than be bothered with experiments that might lead to improvement. Only too often he cannot conceive that improvement upon what he practises is necessary or even possible. If the practical man had had his way medicine would still be at a stone age level, although there is evidence that even neolithic man was prepared to experiment—at least to the extent of opening skulls successfully.

My present thesis is, then, that the most important element in medical education is theory, not practice. All practice—even driving a nail—is based upon some sort of theory, however nebulous. Given good theory any reasonably adept person can be taught good practice, but without sound theory practice is misdirected and may become positively dangerous. That is not to deny that good theory can come from practice. The bedside is the clinician's laboratory and provides in addition the ultimate test for any medical theory. A tremendous amount of valuable observation has been gained from that source. But while it remains only observation it is still purely empirical. Before such facts can be woven into fruitful scientific theory they must be sorted in various combinations, checked experimentally against working hypotheses in the laboratory, and finally verified at the bedside once again under properly controlled conditions. I doubt whether even today anyone would venture to assert that we have achieved all that with, say, such well-known clinical observations as those made by Bright and Addison over a century ago.

Since I am a teacher myself, my sympathies are with my fellow teachers, who, in Australia anyway, struggle against the handicaps of shortage of staff and equipment, overwork and general apathy, to instil even one spark of scientific enlightenment into the minds of those who will shortly be entering upon medical practice. Only love of teaching and research, and the fact that occasionally we do encounter minds worth fostering, sustain us. George Bernard Shaw once said that those who can, do; those who can't, teach. This typically Shavian gibe comes strangely from that master of insincerity, who himself amassed a substantial fortune by teaching—that is, by telling other people what they should do. Also, he ignores the fact that if the teachers are good teachers they have found their proper niche by doing what they can do best. Actually, most academic workers are not less adept than their practising colleagues, and many of the laboratory procedures they devise, and turn over to their technicians as a matter of course, would tax the practical resources of the ablest practitioners.

There is a general belief that clinical teachers should rival their practising colleagues in practical skill. It is also held that students respect most the teacher who can hold his own technically. On the contrary, as Gilbert Ryle points out, "there is no contradiction, or even paradox, in describing someone as bad at practising what he is good at teaching". A case in point is Embley, the famous Melbourne authority on anæsthetics. As a teacher and research worker he was in the first class, but as a practising anæsthetist he was far less successful. Yet all subsequent generations of anæsthetists, and their patients, have gained enormously from his work. As for the students—well, I have recently visited medical schools where the students took their pride in the world-wide reputation their teachers had won from fundamental contributions to medical knowledge, and not from a purely technical proficiency. In the outcome, fundamental contributions to knowledge benefit a much greater mass of humanity—both actual and prospective—than any localized exercise of some special skill.

In Australia, the basic medical sciences are reasonably well provided for on Australian standards; which are lower than those in Europe and America. We are still hopelessly understaffed and underequipped, but at least we have some full-time teachers who can think about education. On the clinical side, apart from Sydney, no medical school has full-time heads of the major departments of medicine and surgery, and education inevitably suffers. It is my contention that clinical teaching can never rise much above the level of technical instruction until the clinical departments have full-time heads, free to devote themselves wholly to the wider aspects of education, and enjoying all the facilities necessary for promoting an educational outlook by contributing actively to the store of medical knowledge.

It has been asserted that the head of such a department should make his knowledge available to local practitioners by engaging in consultant practice. That, I feel, is a fallacious argument. The head of a department is, in my experience, always available to give expert advice on particular subjects; but to distract him from the wider sphere of research and education into a limited consultant field is a waste of his time and potentialities. Actually, the main—even if unacknowledged—reason for permitting a professor the right of consultant practice is not educa-

tional but economic—the medical school cannot or will not provide a salary adequate to compete with what he can earn privately. This problem is much more acute in the United States than it is in Australia, but in the United States the best medical schools will run the risk of impoverishment to secure the best teachers and research workers. That policy is warmly approved by educational authorities in America, but such an attitude is scarcely conceivable in Australia. Only in Britain has the problem of competition been solved, and there the solution was to control consultants' fees and increase university salaries to a comparable level. I am loath to believe that that is the only solution possible. But unless some solution is found, and university salaries in Australia are raised to a level comparable with those of practitioners, then the problem of staffing medical schools will remain as acute as ever, and teachers will inevitably feel badly used—considering their value to the community. Medical practitioners should not be surprised, therefore, if their struggle against controls does not receive the academic support they might feel it deserves.

Whilst I am on this theme let me add that I consider that medical education in itself is a full-time occupation, and that it should be in the hands of somebody able to devote his whole attention to the subject. Many American and some English medical schools have full-time deans. To the best of my knowledge that system works very satisfactorily. The organization and administration of a medical school are major tasks, quite comparable with the organization and administration of any department. Moreover, modern advances in medical thought in its educational, and particularly its social, aspects provide as much creative outlet as the research work of a scientific department. That applies especially to a school like ours, which is, we hope, on the verge of major expansion in the clinical field.

From what I have said, it will be clear that I am on the side of academic medicine rather than practice. My reason is, as I have said, that it is academic medicine which advances both education and knowledge, and if they are catered for practice gains automatically. The academic investment returns a much more handsome profit in the long run.

This viewpoint is not, of course, a new one. Just over a century ago the University of London founded University College and its hospital to improve the status of medical education in London. The older medical schools joined in later, but University College remains the premier school there. In the 1870's Billroth, the famous German surgeon, outlined the academic requirements of medical education in the German schools, which had achieved scientific pre-eminence in medicine by the beginning of this century. When the deplorable state of many medical schools in America was disclosed some forty years ago by the report of the American Medical Association, the Rockefeller Foundation commissioned Abraham Flexner to make a world-wide survey of medical education. His report emphasized the advantages of the German academic system and influenced strongly the pattern of reorganization of American medical schools. Britain followed more slowly, but now most schools have full-time heads of departments, and today no responsible commission on medical education would venture to suggest that training in the basic medical sciences should be curtailed to provide more time for technical instruction. Australia is at present in approximately the stage of development that existed in England more than a quarter of a century ago. We are long overdue for serious reform, particularly on the clinical side.

I know that many feel that medical schools in Australia are quite adequate—that they turn out good medical practitioners. As far as medical practitioners are concerned that is certainly true—Australian graduates can hold their own in that respect with any. But when it comes to handling our brighter products—our future consultants, teachers and research workers—the term "turn out" assumes an unfortunate guise. For we literally do turn them out—to go anywhere else they can to seek the additional training, experience, laboratory facilities and intellectual inspiration which they cannot get here. Having found those things elsewhere, our brightest people are unlikely to want to return to this barren and underpaid atmosphere. At the moment practically the whole of our medical teaching capital is borrowed from overseas, and we are giving very little in return. In consequence, our schools are held in low esteem by medical educationists from more advanced countries.

Here I might add that the attitude towards medical education in Australia is a trifle distorted. The prevailing viewpoint is that medical schools exist to produce medical practitioners. That is not the case. The fact that the medical schools are all within universities is the major argument against that. Universities do not exist to promote technical instruction as such. Their purpose is to foster education, and on the medical side they claim no more than to teach the medical sciences as a branch of education. Any technical ability that may accrue *en passant* is purely a by-product. A university diploma of proficiency in the medical sciences is no guarantee of proficiency in medical practice, nor are the universities competent to issue licences to practise—that is done by an entirely different body. In many countries, indeed, the licensing body does not accept the university diploma as such and conducts its own examinations on practical proficiency frequently after a period of practical experience in a hospital. The fact that here such licences are automatically issued on the production of a university diploma proves only that university teaching in the medical sciences provides an adequate basis for the practice of medicine. Actually, university teaching provides for a great deal more than that, but such further potentialities are, unfortunately, only rarely realized in this country.

Finally, let me warn against too rigid a conception of the organization of medical education. A completely coordinated, clearly defined and strictly circumscribed programme is easy to conceive and manage, and carries a wide appeal. But anything that is completely coordinated, clearly defined and strictly circumscribed is already dead. As Flexner points out, a living and growing subject inevitably has ragged edges, and as long as medicine has ragged edges and ill-defined border-lines there is hope that it is still a living and growing subject. Such irregularities, then, should not be considered a source of annoyance; rather should they be viewed with pride, as evidence that medicine remains vigorously capable of advancement.

FUNCTIONAL UTERINE HÆMORRHAGE.[1]

By ARTHUR M. SUTHERLAND, M.D. (Glasgow), F.R.F.P.S. (Glasgow), M.R.C.O.G.,
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ONE of the most frequent conditions encountered in gynæcological practice is that known as functional uterine hæmorrhage, or, as some writers prefer to call it, dysfunctional uterine hæmorrhage. Although a large volume of literature has accumulated on this subject in recent years, the term "functional uterine hæmorrhage" is still ill-defined and is subject to varied interpretation by different workers. In most instances, however, it is applied to cases of abnormal uterine bleeding occurring in the absence of any palpable lesion of the reproductive organs to explain it. On the other hand, Brewer and Jones (1948) state that although most writers include under this designation only those cases in which there is no gross pelvic abnormality, they believe that it can occur irrespective of the presence or absence of gross pelvic abnormality, and that the ovarian and endometrial changes are identical in each instance.

[1] Based on a post-graduate lecture given at the Royal College of Obstetricians and Gynæcologists on April 28, 1950.

DIAGNOSIS.

Widely differing views have been expressed regarding the desirability of routine diagnostic curettage in cases of presumed functional hæmorrhage, and a number of writers go so far as to advise against this procedure in the treatment of younger patients. Recently (Sutherland, 1949*a*), I stressed the fact that a diagnosis of functional hæmorrhage should not be made, irrespective of the age of the patient, until curettage had been carried out and the endometrium had been examined histologically. In this paper an analysis was made of the endometrial histological findings in 1000 cases of abnormal uterine bleeding occurring in the absence of gross pelvic abnormality. All patients with bleeding after the menopause and all types of abortion were excluded, but cases in which slight cystic enlargement of one ovary was found and cases in which slight symmetrical uterine enlargement was present were included in the series.

No attempt was made in any instance to obtain endometrium at any particular time in the menstrual cycle, the patients being admitted to hospital from the waiting list in the usual way and operation being performed as soon as possible after their admission. In 139 instances organic pathological lesions of the endometrium were found, chronic endometritis occurring in 110 cases, uterine polypi in 11 cases, tuberculosis in 10 cases and malignant disease in eight cases.

Chronic Endometritis.

After the introduction of the curette about 100 years ago, a good deal of attention was paid to the histological appearances of the endometrium in cases of abnormal uterine bleeding. The earlier writers on the subject were all of the opinion that, in the group of conditions now classed under the heading of functional uterine bleeding, the curettings invariably showed evidence of inflammation. However, this whole-hearted acceptance of endometritis as the cause of uterine bleeding in the absence of gross pelvic disease was somewhat short-lived. After doubts had been expressed by a number of writers, the matter was finally cleared up by the very important work of Hitschmann and Adler (1907), who showed that the only true endometritis was the interstitial type, in which the histological features corresponded to those of inflammatory conditions in other organs. In addition, they emphasized the importance of demonstrating plasma cells in all cases of endometritis.

In every case in my own series, the endometrium was stained by the Unna-Pappenheim method in order to facilitate the recognition of plasma cells. The endometritis was invariably of the interstitial type, and a diagnosis was made only when examination of the endometrial stroma showed infiltration with lymphocytes and plasma cells in appreciable numbers. Various histological pictures were seen in these cases, but it was considered undesirable to include any endometrium showing chronic inflammatory changes with the "functional" group, irrespective of the general histological pattern. However, a few writers include chronic endometritis in the category of functional uterine hæmorrhage.

Uterine Polypi.

Little attention has been paid to the question of unsuspected uterine polypi as a cause of bleeding in cases provisionally labelled "functional", though it has been suggested that many cases of functional uterine bleeding cured by a single curettage are explained on the basis of an unrecognized endometrial polypus. Eight of the 11 polypi in my own series were of the mucous endometrial variety, two were fibroids and the remaining specimen was of the adenomyomatous type. As one of the patients with a mucous endometrial polypus was aged twenty-five years, it is apparent that all young patients with abnormal hæmorrhage should be curetted to exclude this condition. Although cases of uterine polypi are not usually included under the heading of functional hæmorrhage, this has been done in the past by a few writers.

Endometrial Tuberculosis.

In a previous paper (Sutherland, 1943) I discussed the subject of unsuspected endometrial tuberculosis in some detail. Out of a total of 58 cases of uterine tuberculosis, in 34 the condition was apparently limited to the uterine body, and there was no clinical evidence of involvement of other pelvic structures. In nine of these 34 cases the principal complaint was profuse and sometimes irregular menstruation. In each of the present 10 cases the tuberculous infection was of the miliary variety. The youngest patient in this group was unmarried and aged nineteen years, and I have since seen a similar condition in a girl seventeen years of age. These examples illustrate the importance of diagnostic curettage in the investigation of young unmarried girls with uterine bleeding. I believe that the disadvantages of this procedure have been greatly over-stressed in the past, and I have not so far seen any ill-effects from its use in adolescent patients.

Malignant Disease of the Uterus.

All the patients with malignant disease of the uterus were in the later age groups, the youngest being aged thirty-six years. Seven patients had carcinoma of the uterine body and the eighth, the youngest of the group, had a round-cell sarcoma. It is thus apparent that malignant disease of the uterine body can occur considerably before the age of forty years and in the absence of palpable pelvic disease. The youngest patient with carcinoma of the uterine body in my own experience was aged thirty-three years, but cases of such growths occurring in much younger women have been reported from time to time. Although undoubtedly rare, these cases of uterine carcinoma in young women constitute an additional argument for routine diagnostic curettage in all cases of unexplained bleeding.

ENDOMETRIAL HISTOLOGICAL FINDINGS IN FUNCTIONAL UTERINE HÆMORRHAGE.

In the remaining 861 cases in my series, the endometrium showed no histological evidence of organic disease. Endometrial hyperplasia occurred 265 times, irregular ripening of the endometrium 26 times, irregular shedding of the endometrium 13 times and endometrial atrophy 10 times; the remaining 547 specimens appeared normal.

Although, for the present purpose, these 861 cases can be regarded as functional, it is probable that in some instances this is not so. In recent years a good deal of work has been done on the relationship between uterine hæmorrhage and various types of blood dyscrasia, and detailed blood examination was not carried out in any cases in my own series. In addition, the possibility of the existence of a pelvic cause of the hæmorrhage which is not apparent on clinical examination must also be kept in mind.

Endometrial Hyperplasia.

Numerous papers have been written on the subject of cystic glandular hyperplasia of the endometrium. Great variations of opinion are found in the literature on the question of the incidence of endometrial hyperplasia in cases of functional bleeding. The work of Hitschmann and Adler (1907) produced a general tendency to attribute all cases of functional hæmorrhage to endometrial hyperplasia, but it is now apparent that this is not the case. In a recent paper (Sutherland, 1949*a*) I analysed the figures given for the incidence of endometrial hyperplasia in 31 separate articles. In a combined total of 4850 cases of functional hæmorrhage, hyperplasia was found 1912 times; this percentage of 39·4 is in reasonable agreement with my own finding of 30·8%.

Irregular Ripening of the Endometrium.

Irregular ripening of the endometrium was first fully described by Traut and Kuder (1935). It represents a mixture of the proliferative and secretory phases of the menstrual cycle. On histological examination of the peripheral zone of the endometrium, a considerable number of areas which are non-secretory are found, and others which

are secretory in appearance. In some cases the non-secretory elements predominate and in others the distribution is more patchy. In order to make such a diagnosis histologically, these changes must be observed in the functional layer of the endometrium and a considerable number of glands must be involved. Endometrial polypi must be excluded, as the endometrium in their neighbourhood tends to be refractory. The question of irregular ripening of the endometrium has received relatively little attention in the literature and its significance in relation to functional hæmorrhage is by no means clear.

Irregular Shedding of the Endometrium.

Irregular shedding of the endometrium has received a fair amount of attention in the recent literature, particularly in the United States, although all the early work on this subject was carried out in Germany. A full description of this condition is given by Traut and Kuder (1935). The phrase "irregular shedding of the endometrium" is used to indicate a specific type of functional uterine hæmorrhage which is characterized by prolongation of cyclic menstrual bleeding from progestational endometrium, and often in addition by an increase in the amount of bleeding.

The diagnosis is suggested by the typical clinical history of regularly recurring menorrhagia, and is substantiated if secretory endometrium is obtained by curettage during the course of the prolonged hæmorrhage, well beyond the time when endometrial regeneration would normally have occurred. For accurate diagnosis the patient must be curetted on the fifth or sixth day of the menstrual period, as endometrium obtained on the first day of the menstrual period in a normal person will show many of the characteristics of irregular shedding. Recent workers have found abnormal prolongation of excretion of sodium pregnanediol glucuronidate in the urine in this condition.

From a study of the literature on irregular shedding of the endometrium, it is apparent that it is much more common than my own figure of 1·5% would suggest. It is probable that the authors in question obtained endometrium some days after the onset of bleeding in some or all of the cases, and it also seems likely that a much higher figure would have been found if it had been possible to do this in my series.

Endometrial Atrophy.

A number of writers have discussed the relationship between endometrial atrophy and functional hæmorrhage, and the figures quoted suggest varied ideas of what is meant by the term "atrophic endometrium". Many other writers, in discussing the histology of functional bleeding, do not even mention this condition. In my own series the term is applied to cases in which the endometrium was thin and scanty, with infrequent, inactive glands, or in which the amount of tissue was so small as to make accurate description impossible. All my patients with endometrial atrophy were in the later age groups, the average age being forty-three years.

Normal Endometrium.

In the remaining 547 specimens the endometrium did not show any histological abnormality, and this figure of 63·2% is in reasonable agreement with the findings of other writers. In 284 of the present cases the endometrium was in the proliferative phase of the menstrual cycle, and in the remaining 263 instances secretory changes were present. It is possible that a higher incidence of secretory endometrium would have been found if it had been feasible to carry out routine premenstrual curettage, though one cannot assess the number of cases of anovulatory bleeding in this group from the information available.

Conclusions from Histological Findings.

To sum up the question of the histological findings in the endometrium, I believe that my figures show that it is desirable to carry out histological examination of the endometrium in all cases of presumed functional uterine hæmorrhage, irrespective of the patient's age. If this is done, unsuspected organic conditions of the endometrium can be discovered. In addition, information may be obtained which is likely to be of value if hormonal treatment is contemplated. In fact, without information about the state of the endometrium, hormonal treatment of functional hæmorrhage seems unjustifiable.

It will be apparent from these histological findings that there is no single endometrial pattern associated with functional uterine hæmorrhage, and that abnormal hæmorrhage can occur from any type of endometrium. In my own cases, attempts to correlate the histological appearances with the type of hæmorrhage and with the findings on pelvic examination failed to demonstrate any relationship in either instance.

Clinical Features.

It will be necessary to refer only briefly to the clinical aspects of functional uterine hæmorrhage, as these are well known to all gynæcologists. The condition can occur at any stage of reproductive life, but it is most frequent in the fifth decade. The abnormal bleeding is most commonly of menorrhagic type, but metrorrhagia is also a frequent occurrence. In the most severe cases the hæmorrhage may be continuous over many weeks. In some instances it may be so severe as to exsanguinate the patient and in exceptional circumstances it may even be fatal.

Literature on Treatment.

In 1949 I reviewed the literature on functional uterine hæmorrhage since 1938 (Sutherland, 1949*b*). Most of the papers which have appeared during this period deal with the treatment of this condition, and a striking feature is the remarkable variety of therapeutic measures advocated by different writers. Comparison of results is rendered extremely difficult, owing to different conceptions of what is meant by "functional hæmorrhage", inadequate diagnostic criteria in some instances and the small size of many of the series of cases. An interesting feature is the fact that a substantial percentage of success is claimed for almost every type of treatment. Indeed, the variations in the measures employed are so great that it is impossible to avoid the conclusion that in many of these cases the condition is self-limiting, or that recovery is sometimes brought about by psychological means.

The present views on the treatment of functional hæmorrhage are well reviewed by Novak (1946). He stresses the fact that there are many cases of a mild type in which no treatment is called for, because they correct themselves spontaneously, and that this is particularly true of the anovulatory bleeding so often seen at the two extremes of menstrual life. Many girls do not begin to ovulate until some months or even several years after puberty, and similarly many women cease to ovulate a considerable time before the menopause.

Operative Treatment.

When diagnostic curettage has been performed in cases of presumed functional hæmorrhage, the curettage itself, in a considerable proportion of cases, appears to bring about an endocrine readjustment, so that subsequent menstruation is normal. It is, of course, possible that the psychological effect of the operation plays some part in producing favourable results. In severe and persistent cases a permanent cure can be effected by hysterectomy, though this drastic measure is rarely necessary and is almost entirely confined to patients in the late thirties and after. Other operative measures recently suggested include the exchange of ovarian grafts between pairs of women suffering from contrasting conditions such as menorrhagia and amenorrhœa, and the imbedding of flaps of omentum or mesentery in each ovary on the basis of the fact that œstrogens are inactivated by the human liver.

Local Uterine Treatment.

The management of uterine hæmorrhage by various forms of local uterine therapy has been fairly popular in the past, but it has received little attention in recent years.

Novak (1946) states that it is probably fortunate that these methods did not achieve wide vogue. The intrauterine use of zinc chloride in cases of uncontrollable uterine bleeding has recently been advised by several writers. The disadvantages of this treatment appear to be the severe abdominal pain and pyrexia which constantly appear after introduction of the zinc chloride pencils, and the fact that uterine function is usually permanently destroyed. Atmocausis (steam therapy) and diathermy electrocoagulation have also been suggested and good results are claimed for both methods.

Treatment with Radiotherapy.

The use of radium or deep X-ray therapy in the treatment of functional uterine hæmorrhage has been recognized and widely practised for a considerable number of years. In consequence, this form of treatment has not received much attention in the recent literature. Several workers advocate low-dosage irradiation of the pituitary gland and ovaries in the treatment of functional hæmorrhage. Good results are claimed by these writers; but it has recently been suggested that there may be serious harm to the offspring in the third or fourth generation in animals and that, as the use of this treatment in humans is less than twenty years old, nobody yet knows what will happen to these generations. Other forms of radiotherapy recently recommended include small intrauterine doses of radium, irradiation of the ovaries alone, irradiation of the spleen and pituitary, irradiation of the spleen alone, and irradiation of the long bones.

Endocrine Therapy.

Many papers have been published in recent years dealing with the treatment of functional uterine hæmorrhage with various endocrine preparations. It will be seen that considerable variations exist, not only in the preparations used, but also in dosage and methods of administration.

Treatment with Œstrogens.

Treatment of functional uterine hæmorrhage with œstrogen preparations is of relatively recent origin. For a number of years it was thought that all, or at any rate most, cases of functional bleeding were associated with endometrial hyperplasia and a relative excess of œstrogen, and that it would, in consequence, be illogical to employ œstrogens in its treatment. It is now apparent from my own figures and from many recent publications that the incidence of hyperplasia is much less than was previously supposed.

Although some writers do not regard œstrogen treatment of functional hæmorrhage with favour, it has become increasingly popular in recent years. The leading advocate of this method is Karnaky, who has written many papers on this subject since 1939. He explains the action of œstrogens in these cases as follows (Karnaky, 1941):

> At a certain estrogenic hormonal blood level which varies in each individual and locality, a constriction of the spiral arteries of the endometrium occurs. This leads to anemia, dehydration, anoxemia, necrosis, dilatation of the spiral arteries and subsequently to bleeding or menstruation. A woman bleeds or menstruates only when the estrogenic hormones reach a certain blood level, above and below which the woman is amenorrhœic, regardless of the condition, size, position, shape or contents of the uterus.

Karnaky has used several œstrogens in varying dosages in the course of his work, though fairly large doses are employed throughout. He holds that functional bleeding can be arrested by the use of œstrogens given orally or intramuscularly, or injected into the anterior lip of the cervix, and supports this statement with some impressive results in large series of cases. He has emphasized the safety of diethylstilbœstrol, stating that he has used this drug in the treatment of 3227 patients with various complaints and has had no serious disturbances. A point worthy of mention is that many of his patients with functional hæmorrhage were also given thyreoid and "Lipiodine", and it is not possible to state what part these substances played in his results. I have reviewed the literature on œstrogen therapy in functional hæmorrhage in two recent publications (Sutherland, 1949*b* and 1950).

Apart from the use of œstrogens in functional hæmorrhage in general, it has been suggested that this treatment should be used in irregular shedding of the endometrium. As this condition is characterized by the prolongation of bleeding from progestational endometrium, administration of œstrogenic substances during the bleeding phase might be expected to speed up the process of regeneration. The results obtained so far have been disappointing, but it is thought that this form of treatment has not yet been adequately tried out.

Several writers have employed a combination of one of the œstrogens and either progesterone or pregneninolone, the drugs being administered cyclically. The results obtained with this combined therapy have been generally satisfactory, and while the hæmostatic effect does not appear to be better than that obtained with œstrogens alone, some workers find that an appreciable number of patients show a return from an anovulatory to an ovulatory menstrual cycle.

Treatment with Progesterone.

The use of progesterone in the treatment of functional hæmorrhage has been widely accepted for a number of years, although the results have often been far from satisfactory and are certainly inferior to those obtained with the œstrogens. In many of the reported series the results are inconclusive owing to the small numbers of patients treated. In others the results are difficult to assess, as some of the patients were treated with progesterone and others with anhydro-hydroxy-progesterone (pregneninolone or ethinyl testosterone).

Pregneninolone is a potent, orally-active progestational substance, which in addition produces both œstrogenic and androgenic effects to a mild degree. It has been used by a number of workers in recent years in the treatment of functional hæmorrhage, and a notable feature is the variability of the results obtained. In spite of the advantage which it possesses over progesterone in that it is potent by mouth, it appears to be less satisfactory than that substance.

Treatment with Androgens.

A considerable literature has accumulated in recent years on the treatment of functional hæmorrhage with androgen preparations. While the majority of workers are satisfied with the results obtained, this treatment is certainly rather expensive, and there is always the risk that signs of virilism may develop. Most workers have used injections of testosterone propionate, but methyl testosterone has occasionally been employed orally with success.

Treatment with Gonadotrophins.

Although a great deal has been written on the treatment of functional hæmorrhage with various gonadotrophins, the results have been unsatisfactory in many instances, while the treatment not only is rather expensive but is by no means devoid of risk to the patient. Although some workers use gonadotrophic preparations in all types of functional hæmorrhage, their use is usually restricted to proved cases of anovulatory hæmorrhage. Many papers have been published on this subject, and extremely variable results have been obtained. Some workers have treated functional hæmorrhage with blood from pregnant women or with preserved placental blood. It is held that this treatment supplies gonadotrophins, and when given by intravenous transfusion also helps the patient by reducing anæmia.

Treatment with Prolactin.

In view of the fact that the only true period of physiological amenorrhœa apart from pregnancy occurs during lactation, intramuscular injections of blood from lactating, amenorrhœic women have been used in the treatment of

functional hæmorrhage. Cessation of hæmorrhage was brought about in the majority of the patients treated, but it is emphasized that this method of treatment is only a stop-gap and does not prevent a recurrence. In view of these results, and of the fact that experimental evidence has demonstrated the anti-gonadal effect of lactogenic preparations, several writers have used prolactin in the treatment of functional uterine hæmorrhage. Satisfactory results have been reported, but a disadvantage of the method is that fairly frequent injections are required.

Treatment with Pitressin.

Pitressin tannate in oil has been used as a hæmostatic agent in cases of functional uterine hæmorrhage. The results obtained have so far been encouraging, but the drug does not appear to alter the endometrial or hormonal pattern and in that sense is not a cure for the causative condition. The action is probably mechanical, primarily on the endometrium and myometrium.

Treatment with Pineal Gland.

The use of pineal gland extract in the treatment of uterine hæmorrhage has been advocated. It has been suggested that its mode of action is still unknown, but that it probably exerts a direct or inhibitory action on the sexual organs.

Treatment with Thyreoid.

The use of thyreoid in the treatment of functional uterine hæmorrhage has been popular for a considerable number of years. Very good results have been obtained by the use of desiccated thyreoid for patients with uterine hæmorrhage and a low basal metabolic rate.

Treatment with Vitamins.

Several papers have been published in recent years dealing with vitamin therapy in functional uterine hæmorrhage. In some of these the results obtained have been satisfactory, although the existence of a deficiency of the vitamin concerned has not always been shown.

Vitamin B.

The rationale of vitamin *B* therapy in functional hæmorrhage is based on the inability of the liver to conjugate and dispose of œstrogens unless it is adequately supplied with the vitamin *B* complex, especially thiamine and riboflavin. Thus hypoœstrinism is present in vitamin *B* deficiency. Although vitamin *B* has not been extensively used in the treatment of functional hæmorrhage, satisfactory results are claimed by the authors who have employed it.

Vitamin C.

Several writers have discussed the relationship between vitamin *C* deficiency and uterine hæmorrhage. It has been suggested that if, after administration of vitamin *C*, large amounts are excreted in the urine, there is no deficiency of this vitamin and treatment with it will not influence abnormal bleeding. Good results have been obtained with this treatment, especially in cases of uterine bleeding in which vitamin *C* deficiency could be demonstrated.

Vitamin K.

Varied views have been expressed about the value of vitamin *K* in functional hæmorrhage. Some writers have found it to be of little value, while others have obtained good results.

Other Forms of Treatment.

Anti-menorrhagic Factor.

After the introduction of liver extracts for oral use in the treatment of anæmia, it was observed that some of these preparations appeared to check functional uterine hæmorrhage. Although the original purpose of the liver therapy was to treat the anæmia produced by this hæmorrhage, there was often a definite diminution or cessation of the abnormal hæmorrhage itself, even though the blood count was unaffected. This property was found in the cruder preparations but not in the highly purified solutions. Since this purification did not involve any treatment likely to inactivate any constituent, it was probable that the fraction in question was removed in the process of purification. This active principle was later isolated and named the anti-menorrhagic factor.

In a previous publication (Sutherland, 1942) this question is discussed in some detail and the results obtained with this treatment in 50 cases of functional hæmorrhage are given. On the whole the results were satisfactory, being best in young women and tending to become less effective as the age of the patient increased. The preparation is administered orally, it is relatively inexpensive and it causes no ill-effects of any kind.

Snake Venom.

Snake venom is said to act upon the walls of the arterioles, decreasing or controlling uterine bleeding in certain cases. Moccasin snake venom in a one in 3000 solution is given by subcutaneous injection. This treatment has been used by several writers, but the results have shown many failures. In addition, there is an appreciable risk of sensitization to the venom.

Vaginal Actinotherapy.

Vaginal actinotherapy has been used in the treatment of uterine bleeding and good results have been claimed for this method. A disadvantage is that special lamps are essential.

Other Hæmostatic Drugs.

In addition to all the measures mentioned, recent writers have recommended the use of such hæmostatic drugs as "Koagamin", which contains as its principal agent active oxalic acid, thereby producing a lowered blood coagulation time, and "Basergin" or "Neogynergin".

General Plan of Treatment.

As I have already emphasized, all patients with presumed functional hæmorrhage should have a preliminary diagnostic curettage in order to eliminate unsuspected organic conditions of the endometrium. In the investigation of those patients with a reasonably regular menstrual cycle, the best time to carry out this procedure is the premenstrual phase. I have shown in a previous paper (Sutherland, 1943) that curettage at this time will afford the best chance of detecting tuberculosis. In addition, irregular ripening of the endometrium will be apparent and anovulatory bleeding from a proliferative-phase endometrium can be diagnosed. In cases in which premenstrual curettage reveals no endometrial abnormality, it may be necessary to repeat the operation during a subsequent spell of bleeding on or after the fifth day, in order to find whether the cause is irregular shedding of the endometrium. In the investigation of patients with a completely irregular cycle, accurate planning of the time of curettage is not, of course, possible.

Once organic disease of the endometrium has been eliminated, the remaining patients should be followed up. It will then be found that a considerable number have been cured by the curettage, although the exact mechanism by which this is brought about is uncertain.

The patients who are not cured or greatly improved by curettage require further consideration, and they can conveniently be divided into three categories.

Patients Aged Over Forty Years.

Those patients who are at or near the menopause form a large group. In my series of 861 cases of functional uterine hæmorrhage, 339 patients were aged over forty years. With very rare exceptions, I believe that either hysterectomy or radiotherapy is the method of choice in cases of persistent bleeding in this age group.

Patients Aged Under Twenty Years.

Patients aged under twenty years are not very numerous; in my own series only 33 were in this category. I have found that almost all patients in this age group can be cured by the use of the anti-menorrhagic factor. In the treatment of the few young patients in whom it is ineffective, I have obtained satisfactory results by the use of cyclic oral œstrogen therapy.

Patients Aged between Twenty and Forty Years.

The patients in the twenty to forty years group are numerous; in my series of 861 functional cases, 489 patients were in this group. The anti-menorrhagic factor is often successful in the treatment of the younger patients in this category, but its efficacy diminishes rapidly with age, and I now rarely employ it for patients aged over thirty years. In some severe and intractable cases when the patients are in the late thirties, I believe that it is occasionally justifiable to perform hysterectomy.

In the treatment of the remainder, I have obtained good results with oral œstrogen therapy in persistent cases. In the planning of endocrine treatment of such patients, attention should be paid to the endometrial histological findings and the alternative of androgen treatment should be considered in cases in which endometrial hyperplasia is present.

Other Considerations.

The occasional patients who show no improvement after treatment on the lines indicated should be readmitted to hospital for further investigation. This will include detailed examination of the blood, estimation of prothrombin time, estimation of urinary vitamin *C* excretion, estimation of 17-ketosteroid secretion, estimation of blood cholesterol content, estimation of blood sugar content, estimation of the basal metabolic rate, X-ray examination of the chest, X-ray examination of the *sella turcica*, a Wassermann test, and, in the circumstances previously indicated, a repetition of curettage.

Attention has recently been drawn to the frequency with which menorrhagia is associated with emotional difficulties, such menorrhagia being particularly common in young women and being cured by simple psychotherapy. The possibility of a psychological basis for the bleeding must thus be kept in mind and patients who may fall into this category should be examined by a psychiatrist.

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SOME OBSERVATIONS ON PANCREATIC PAIN.

By J. K. MOWAT, M.S.,
Brisbane.

THE pancreas lies behind the transverse mesocolon, in close anatomical relation to the aorta and inferior *vena cava*, the splenic and superior mesenteric vessels, the portal vein, the renal vessels, the common bile duct, and the gastro-duodenal artery and its branches. Immediately superior are the cœliac ganglia on the right and left crura of the diaphragm and on each side of the cœliac axis. This is not a region in which the occasional surgeon may delve with much confidence or safety. However, many of the more recent clinico-pathological concepts and therapeutic advances concerning the pancreas are of importance to the general practitioner, and there is no doubt that the main obstacle to the diagnosis of pancreatic lesions is the failure to think of them.

The sensory nerves of the pancreas are the afferent fibres of the sympathetic which enter the cœliac ganglion and thence move centrally in the splanchnic nerves. Additional pathways probably exist in the sympathetic trunk and a few observers have discussed their presence in the vagus. The motor activity of the gland is controlled by the duodenal hormone "secretin", which is liberated in response to the entrance of acid chyme through the pylorus and causes a copious discharge of watery juice very poor in enzymal content. Pancreozymin, likewise from the duodenal mucosa, stimulates the production of trypsin, amylase and lipase, while the efferent fibres of the vagus cause a scanty flow very rich in enzymes (Best and Taylor, 1945).

Pain in an organ can probably be caused on occasion by any conceivable lesion, and there is no point in a brief discussion in aiming at academic completeness; therefore no reference need be made to such conditions as hydatid and neoplastic cysts, injuries, mumps, specific granulomata and the like, which are all rare.

The following is a working classification of the lesions of the pancreas in which pain is a common and outstanding feature (Table I):

TABLE I.

Pathological Classification.	Clinical Classification.
Inflammatory:	
Acute glassy œdema.	Mild acute or "subacute" pancreatitis.
Acute pancreatic necrosis. (With all intermediate stages between the two.)	Acute hæmorrhagic pancreatitis.
Recurrent œdema and fibrosis.	Recurrent pancreatitis.
Chronic fibrosis.	
Cystic degeneration.	Chronic pancreatitis.
Pancreatolithiasis. (Often occurring together as one process.)	
Chronic pancreatitis secondary to peptic ulcer.	Penetrating peptic ulcer.
Pseudo-cyst (also post-traumatic).	Pseudocyst.
Neoplastic:	
Carcinoma of the ampulla of Vater.	All frequently regarded together as carcinoma of head of pancreas.
Carcinoma of the distal bile duct.	
Carcinoma of the head of pancreas.	
Carcinoma of the body.	Carcinoma of the body.

The ætiology of all these lesions is obscure, although indeed there is no dearth of theory based both on experimental study and on speculation. As a result of detailed anatomical study by dissection, J. A. Sterling (1949) concludes that bile reflux into the pancreatic ducts can occur only very rarely. On the other hand, typical acute glassy œdema is readily produced experimentally in dogs by the injection of bile into the pancreatic duct (Dickson Wright), and surgeons who perform operative cholangiography can produce numerous films in which the duct system of the pancreas is clearly outlined (Doubilet and Mulholland,

ILLUSTRATIONS TO THE ARTICLE BY R. K. DOIG, J. F. FUNDER AND S. WEIDEN.

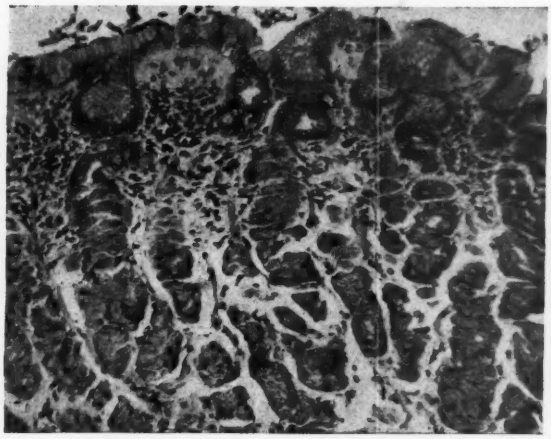

FIGURE II.—351 days before treatment. Hæmatoxylin and eosin stain × 130.

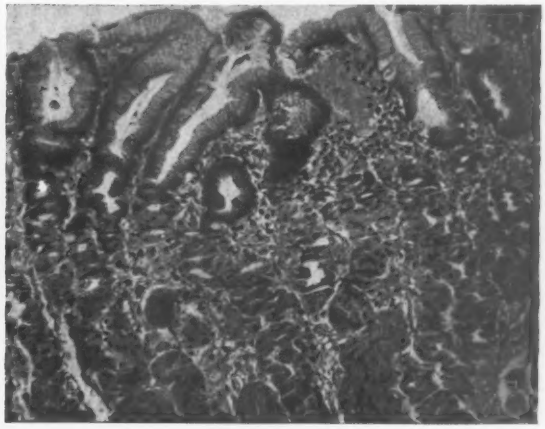

FIGURE III.—Day 1. Hæmatoxylin and eosin stain × 130.

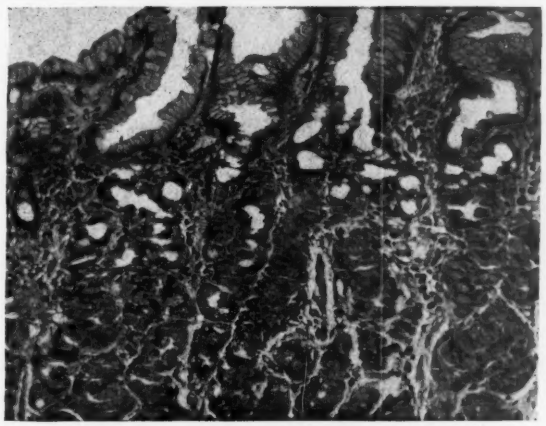

FIGURE IV.—Day 21. Hæmatoxylin and eosin stain × 130.

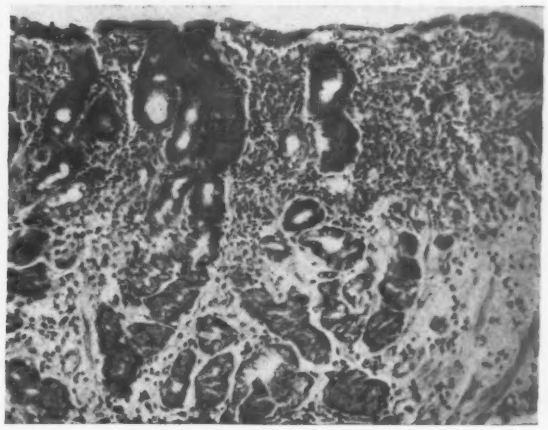

FIGURE V.—Day 38. Hæmatoxylin and eosin stain × 130.

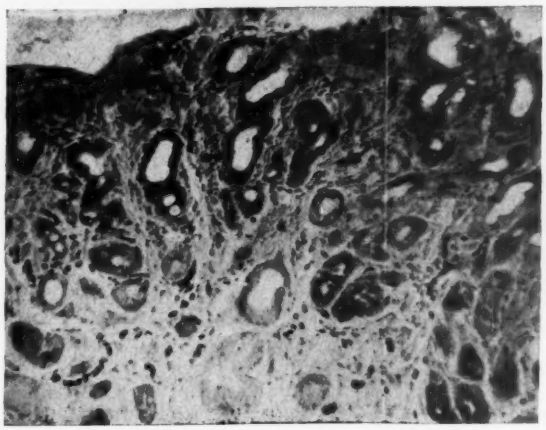

FIGURE VI.—Day 66. Trichrome stain × 130.

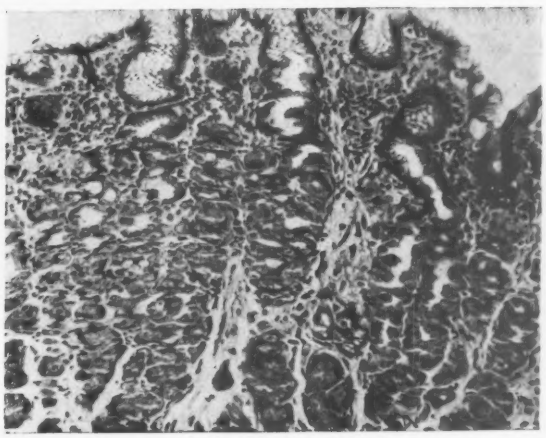

FIGURE VII.—Day 475. Hæmatoxylin and eosin stain × 130.

ILLUSTRATIONS TO THE ARTICLE BY R. K. DOIG, J. F. FUNDER AND S. WEIDEN.

FIGURE VIII.—Day 21. Hæmatoxylin and eosin stain × 550.

FIGURE IX.—Day 38. Hæmatoxylin and eosin stain × 550.

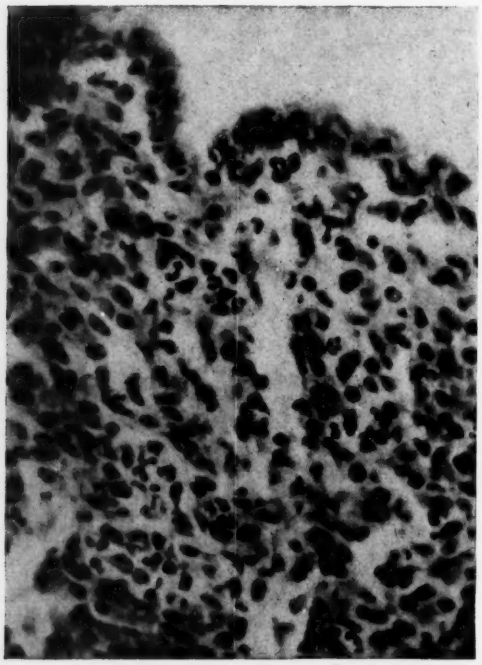

FIGURE X.—Day 283. Hæmatoxylin and eosin stain × 550.

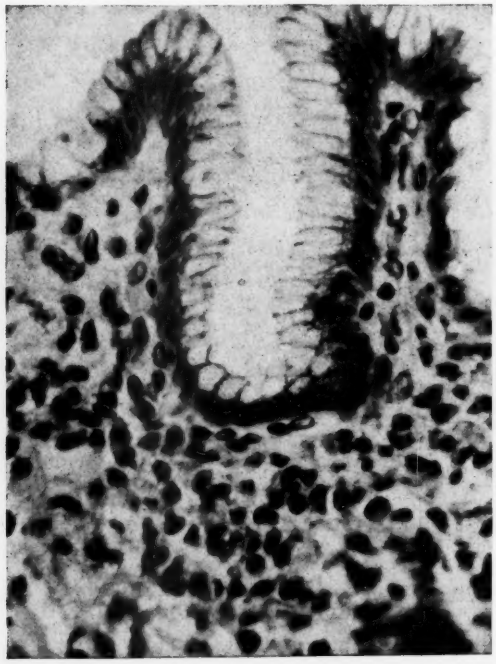

FIGURE XI.—Day 475. Hæmatoxylin and eosin stain × 550.

ILLUSTRATIONS TO THE ARTICLE BY REGINALD WEBSTER.

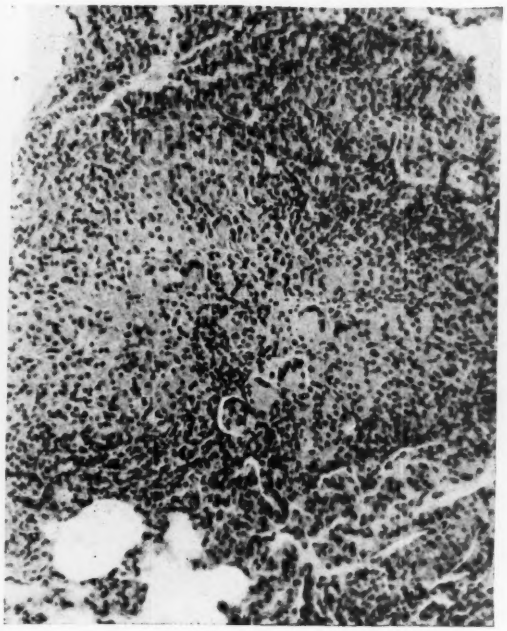

FIGURE III.

Photomicrograph of a field from a section of rabbit's lung shown macroscopically in Figure I: one of many follicles composed of large, pale, epithelioid cells, among which are several multinucleate cells.

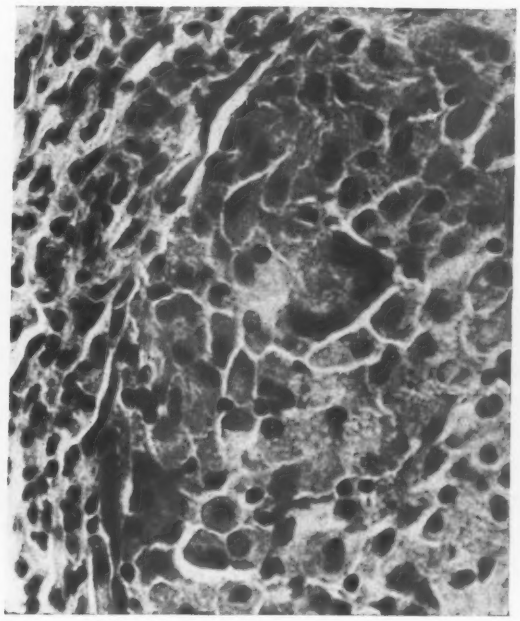

FIGURE IV.

Detail of portion of microscopic field reproduced in Figure III: multinucleate cell surrounded by epithelioid cells.

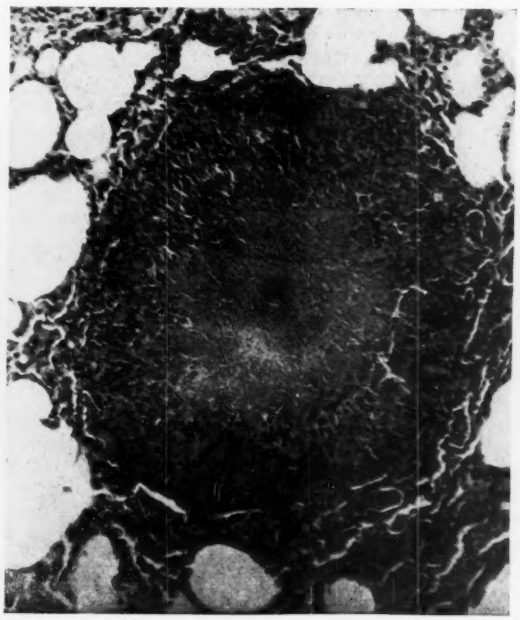

FIGURE V.

Miliary caseous pneumonia in lung of rabbit.

FIGURE VI.

Clumps of acid-fast bacilli stained in microscopic section of lung of rabbit.

ILLUSTRATIONS TO THE ARTICLE BY JAMES A. BONNIN.

FIGURE I.

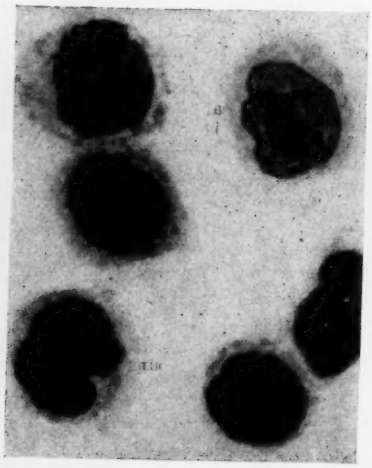

FIGURE II.

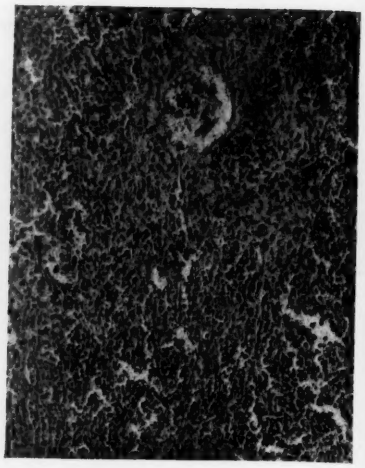

FIGURE III.

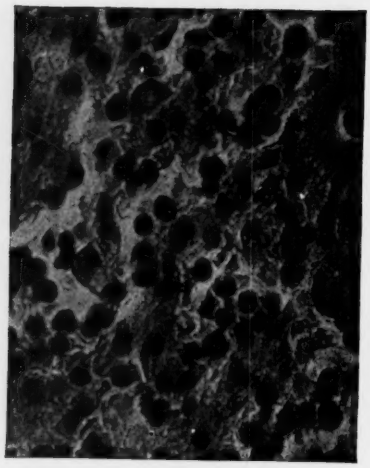

FIGURE IV.

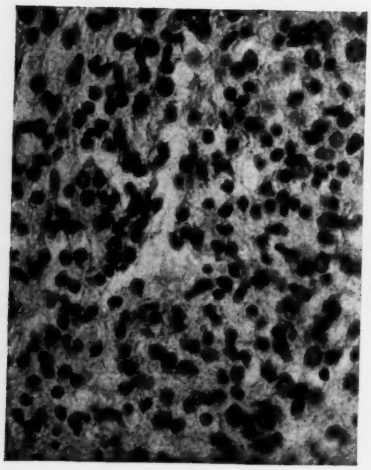

FIGURE V.

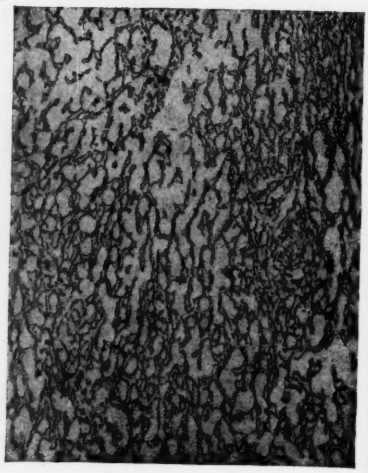

FIGURE VI.

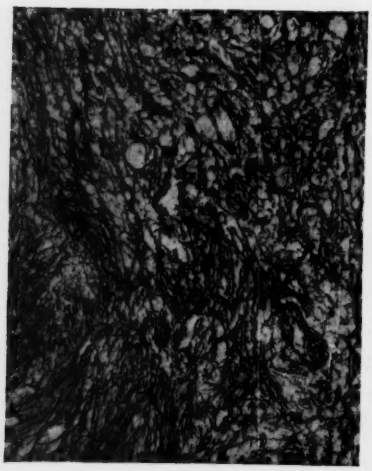

FIGURE VII.

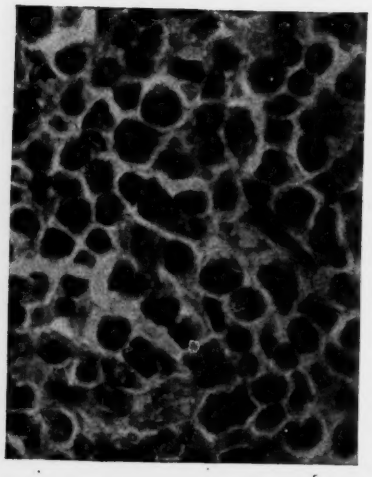

FIGURE VIII.

FIGURE IX.

1949). Such cholangiograms are made by allowing opaque fluid to gravitate into the common bile duct, with and without the concomitant application of N/10 hydrochloric acid into the second part of the duodenum through a duodenal tube. The acid induces spasm of the sphincter of Oddi. The radiological outlining of the pancreatic ducts in this way would seem to prove beyond reasonable doubt that the phenomenon not only can occur in Nature but can occur as a result of a functional disturbance—that is, spasm of the sphincter. However, there is no evidence that a reflux of this nature is at all abnormal in the human subject, so that various other ætiological agents and factors are frequently discussed, such as œdema and metaplasia of the pancreatic ducts, trauma, and blood-borne infection (Howard, 1949; Howard made sustained and determined endeavours to infect himself from three subjects of œdematous pancreatitis proved by laparotomy, but he remains healthy).

Over and above all this, it is postulated with much confidence by some very painstaking observers (Gambill, Comfort and Baggenstoss, 1948) that the biliary tract disease so often associated with chronic pancreatitis, as well as the disturbances of function in the region of the ampulla of Vater, are both secondary to the pancreatitis and in no way causative of it. But from the point of view of treatment in practice it is still accepted by surgeons that inflammatory disturbances of the pancreas are indeed due to the entrance of bile into the substance of the gland, and that this reflux depends upon anatomical variation, gross interference with function as by a stone, or functional upset in the workings of the sphincter of Oddi due to emotional factors or dietetic excesses.

The Cause and Nature of Pancreatic Pain.

There is no doubt that a number of mechanisms are involved in the production of pancreatic pain. In severe examples of acute œdema, chemical irritation of the nerve filaments in the gland parenchyma is said to be associated with arterial spasm. Both of these factors will be nullified by subsequent necrosis and digestion, and be replaced by the pain of peritonitis and paralytic ileus.

In chronic pancreatitis the factors are more complex and may be dissected thus: (i) distension behind fibrous obstruction to the ducts and ductules; (ii) duct colic due to pancreatic calculi; (iii) common bile duct obstruction due to diffuse fibrosis; (iv) incidents of chemical irritation due to pancreatic reflux of bile—that is, mild recurrent œdema; (v) interacinar fibrosis.

It is to be noted that there are two distinct patterns of pain in chronic pancreatitis. In one it is persistent and more or less unrelenting, lasting weeks, months or even years, so that the patient is demoralized by its unyielding perseverance rather than by its severity. Such pain cannot be due to any obstructive phenomenon, and its nature is probably to be sought in the steady pressure of interacinar fibrosis upon terminal nerve filaments. It is in these cases that splanchnicectomy would appear to be indicated. In the other type the symptoms are more intermittent, coming in attacks of varying duration and severity, so that the disease is often designated "chronic relapsing pancreatitis". This type is more active, and although essentially chronic in its over-all course, is punctuated by episodes of severe pain and persistent vomiting, any of which may progress into acute pancreatic necrosis. In this state nerve section would obviously place the patient in immediate danger by masking essential symptoms. Good results are claimed for sphincterotomy, either transcholedochal (from above, with the sphincterotome) or transduodenal (under direct vision, on to a probe in the common duct) (Doubilet and Mulholland, 1949).

Malignant lesions of the head of the pancreas are typically painless and manifest themselves by the production of steadily progressing jaundice with enlargement of the liver and gall-bladder (Couvousier). However, this is by no means always so, and attacks of pain in the right hypochondrium resembling biliary disease are a feature of some cases. In two instances in my own practice the gall-bladder was found to have undergone some degree of fibrosis and consequent loss of distensibility due to previous cholecystitis, so that the immediate brunt of obstructive back pressure would seemingly be borne by the intrahepatic and extrahepatic bile ducts. The attacks of pain are less abrupt, less severe and more prolonged than those of biliary colic.

In carcinoma of the body and tail deep-seated gnawing pain is a characteristic feature; it is said to be due to involvement of the perineural lymphatics in the region of the cœliac ganglion (Boyd). On the other hand, islet cell carcinoma is not associated with pain at all—at least, that is in the relatively few cases reported.

The Essentials of Management.

The following case report illustrates some features in the management.

T.G., a broad, fat, muscular man, aged fifty years, complained of epigastric pain of six hours' duration unaccompanied by vomiting. The pain was constant and boring, and it seemed to be "seized around the front of his backbone". He gave no significant previous history. The bowels were open, but he was not hungry. On examination of the patient, deep tenderness was present above the umbilicus, with a minimum of muscular guarding and diminished but not absent intestinal movements. He was pale and drawn and appeared to be ill, and the pain was obviously severe. His temperature was 98° F., and his pulse rate and blood pressure were more or less normal. On closer interrogation it was elicited that the pain had begun suddenly, not long after an alcoholic bout and a very large meal. From time to time it seemed to shoot into the left shoulder blade. Except for the pain he felt reasonably well, and it was his opinion that he had "strained his innards". The definite and unequivocal nature of these symptoms and the abruptness of their onset were indicative of visceral disease, and it was decided that the most likely site of the lesion was the pancreas. The urinary diastase content was 160 units. The patient was treated by starvation, and the administration of pethidine, atropine and papaverine, and his condition settled down in a matter of six or eight hours. The attack has not been repeated in two years.

I think this type of illness is less uncommon than is ordinarily conceded. If one could see the pancreas it would be in a condition of "glassy œdema", with very little intraperitoneal exudate beyond some fluid in the lesser sac, with no fat necrosis, no hæmorrhage and no pancreatic necrosis. Such an occurrence is best looked upon, in the present state of our knowledge, as a mild or incomplete example of what would be acute pancreatic necrosis or "hæmorrhagic pancreatitis". One would expect it to recur.

The essence of the fully developed condition of pancreatic necrosis is the voluminous exudate charged with activated enzyme, which pours into the lesser sac and thence into the greater sac, depleting the blood volume, paralysing the bowel and removing the serum calcium to be fixed as soap. The sheet-anchor of its treatment is gastro-intestinal aspiration and adequate replacement (including the calcium), while the ancillary therapeutic procedures consist in the following measures: (i) The administration of pethidine for the relief of pain without increasing the spasm of the sphincter of Oddi. (Morphine, of course, has been shown to do this, and so, on theoretical grounds at any rate, to aggravate any existing pancreatic reflux). (ii) The exhibition of atropine to inhibit secretion of the acini. (iii) The administration of papaverine to counteract reflex local arteriolar spasm, which is said to be a factor in the progression from glassy œdema to massive necrosis (Popper, Necheles and Russell, 1948). (iv) Paravertebral sympathetic and splanchnic block—similarly for the relief of vascular spasm and of pain (Popper, 1931; Warren, 1950). (v) Epidural procaine block (Orr and Warren, 1950). (vi) The administration of penicillin and other antibiotic medicaments for the control of superadded infection. (vii) The use of insulin when the picture is complicated by hyperglycæmia and glycosuria.

In the case briefly outlined above it did not appear to be necessary to employ aspiration and replacement. (What is more awe-inspiring to a patient and his wife than the

spectacle of tubes dangling from his nose and limbs? And what is more comforting than injections, delivered regularly by a nurse with confident aplomb?) But at the first indication of ileus, at the first vomiting, or at the earliest sign of progressive blood volume depletion, these measures would have been vigorously applied.

In a case such as this the patient might be expected to report with another attack of similar abdominal pain, and then with another, or perhaps with one in which there is fairly persistent and "noisy" vomiting, so that he is more ill and is treated as suffering from acute pancreatitis, with recovery. Is anything to be done, or is each attack to be treated when it occurs?

Such cases are not easy. They are to be managed on their merits and in accordance with the severity of the illness. The following is an outline of procedure:

1. A cholecystogram is obtained. In many instances this will be normal. The radiologist should be requested to take special note of the presence or absence of abnormal shadows within the area of the duodenal loop. If gall-stones are present the patient is dealt with as under the fourth section below.

2. The patient is enjoined to regulate his living. It is well to be specific and to write on paper what is required of him. Patients are much impressed by diet sheets, especially when they are strict; but if he happens to possess, as well as his pancreatitis, a supernormal intelligence, then the principles of diet may be explained. These are: (*a*) the avoidance of very large meals; (*b*) the avoidance of alcohol; (*c*) the avoidance of fried foods, soups, condiments and pastry; (*d*) the avoidance of raw, hard fruits and vegetables; (*e*) the consumption of bland, unseasoned and ungreased foodstuffs, at regular hours and in moderate amounts. To this dietetic regimen is to be added a pattern of routine behaviour, so that there is a purposeful eschewing of tension and emotional stress. Drugs of the barbiturate group, with moderate doses of atropine, are of value.

3. The attacks of pain may continue, but become infrequent and not very severe, so that it may be decided that the case has become one of "chronic relapsing pancreatitis" of mild type. Such a patient may be nursed along as above, with salicylates and codein occasionally for the pain. More powerful drugs, including pethidine and amidone, should not be used unless a move in the direction of radical cure is contemplated.

4. The attacks of pain may last for days, and continue intermittently despite all conservative measures. The gamut of investigations is gone through in an endeavour to exclude all other possible causes of pain. Positive evidence of pancreatic disease, such as calcification, spreading of the duodenal loop or significant increase in serum amylase or lipase content, is by no means always obtained, and these cases are the most difficult. Diagnosis is by exclusion and clinical intuition. A non-filling gall-bladder supports one's decision to advise operation, whereas the radiological visualization of stones is a clear indication to do so.

What is to be done at operation in these cases of subacute and chronic pancreatitis? The following procedures are indicated. (*a*) Inspection of the gall-bladder and cystic gland for evidence of cholecystitis—that is, adhesions, fibrosis and fatty overlay, and enlargement of the lymph node. (*b*) Palpation of the gall-bladder and common bile duct for stones. (*c*) Palpation of the pancreas for enlargement, hardening, calcification, and retention cyst and pseudo-cyst formation. (*d*) Routine abdominal exploration, with special emphasis on stomach, duodenum, kidneys and all retroperitoneal tissues of the posterior abdominal wall. (*e*) Cholecystectomy. Provided one is satisfied that the diagnosis of recurrent pancreatitis is correct, it is probable that cholecystectomy should always be performed, even in the presence of an apparently normal gall-bladder, because there is evidence that the concentrated gall-bladder bile is more noxious to the pancreatic parenchyma than the watery liver bile. However, as was pointed out above, this whole matter of ætiology is speculative, and anyway, in most instances, some gall-bladder disease will be present even if not obvious. (*f*) Exploration of the common bile duct and decompression of the biliary tract. In the past this has been regarded as the one essential of treatment in acute hæmorrhagic pancreatitis, but its use has been discontinued in this condition. In subacute and recurrent pancreatitis, decompression of the bile passages is carried out on the same rationale. One might well speculate on whether the rationale is basically unsound and whether the method might not be ultimately abandoned. There is no doubt that the bile is frequently infected, but some evidence exists that the infection is secondary to the trouble in the pancreas (Richman and Colp, 1950). However, at the present time this procedure is much relied upon, and it would appear to give good results. It is not often that stones will be found in the common bile duct. (*g*) Operative cholangiography. This has been described above; it is a manœuvre frequently carried out in the United States, and it is apparent that many films show a reflux of the opaque medium from the bile to the pancreatic duct. But operative cholangiography is not the sort of exercise one can practise upon normal subjects, so that the pathological significance of the reflux is unproven. On the other hand, post-operative cholangiograms taken after the performance of sphincterotomy show no reflux. (*h*) Sphincterotomy. This is at present the therapeutic procedure of choice for recurrent pancreatic inflammation. It is best performed deliberately through the duodenum after a probe has been passed to the ampulla through the common duct. The muscle ring is cut across in its whole substance so that it gapes and will not heal together. A "T" tube with a long distal limb is placed in the common duct so that the distal limb reaches well into the duodenum through the cut sphincter, and the "T" tube is left for at least a month (Cattell, 1948).

5. The pain may become constant, and demoralizing because of its unrelenting persistence. The diagnosis of chronic pancreatitis is to be made on the history, by careful exclusion, on thoughtful analysis of the pattern of the pain, on X-ray evidence of calcification, on chemical and clinical evidence of pancreatic digestive deficiency and on assays of the glucose tolerance. Some degree of *diabetes mellitus* is common in these patients.

If the cause of the illness is then established with reasonable accuracy, the following measures are available.

(*a*) Afferent nerve section. Supradiaphragmatic splanchnicectomy on one or both sides has given excellent results in numerous reported cases (Reinhoff and Baker, 1947; de Takats, 1947; de Takats, Walter and Lasner, 1950; Warren, 1950). The left side is usually operated on first and the results are observed. The patient is in a position to decide for himself whether the operation should be repeated. More extensive sympathetic ablations of the Peet or Smithwick type are advocated occasionally (Connolly and Richards, 1950); but there is no doubt that such procedures would be rarely warranted. Sub-diaphramatic section at the level of the cœliac ganglia has been performed by Mallet-Guy (eleven cases, 1945). This operation offers obvious advantages in that the remedial gesture can be made at the time of exploratory laparotomy. But the ganglia lie posterior to the caudate lobe of the liver, and the right ganglion is posterior to the inferior *vena cava*, so that they are anything but readily accessible, and exposure from the front must be expected to be difficult.

(*b*) Ligation of the duct of Wirsung causes atrophy of the externally secreting section of the gland. Intestinal indigestion will, of course, become worse than it was before, but even so this operation is considered by many to be the treatment of choice (Maxwell, 1949).

(*c*) Pancreatolithotomy, an older method of treatment, represents a direct attack in cases of severe calculus formation. The results of such an operation must of necessity be uncertain because of the nature of the ailment, and it is now rarely performed.

(*d*) Pancreatectomy—partial and total—has been performed (Blalock, 1947). The fact that such a radical assault would even be contemplated is an indication of the

severity of this illness in some instances. It is of interest that in the reported cases, as well as the relief from pain there has been recovery from the severe weight loss and asthenia which are features of advanced chronic pancreatic fibrosis.

Mrs. G.H., a nulliparous woman, aged thirty-eight years, had consulted many doctors since having her gall-bladder removed twelve months previously. She said that the gall-bladder had been full of small stones, but she still had the same old pain. She felt that a stone must have been left behind, but none of the doctors were much impressed with this pessimistic view, and two of them had confided obliquely to her husband that her nerves were not in a very good state. Nor were they, for she was awakened night after night by pain, which was unrelieved by any medicines, patent or prescribed. The pain was epigastric, radiating through to the right side and centre of the back, and described as "boring". She was restless in the pain, and wriggled about, and sometimes she obtained partial relief from antacid powders. The pain came in attacks lasting six to twelve hours, frequently began at night, and seemed to be worse, or likely to be intensified, a few hours after she had eaten a large meal. She did not vomit, but had lost a few pounds in weight. All these symptoms were subject to periods of remission lasting several weeks, during which time she had a large amount of waterbrash. She had never been jaundiced.

In describing her complaint this woman tended to be lachrymose, rather "edgy", and resentful of the medical profession as a whole. One's impression was that there was a functional element in her symptoms. She looked well, was æsthetically proportioned and not unattractive.

On examination no abnormality was found, except fairly pronounced deep tenderness over the centre of her cholecystectomy scar.

When these symptoms are analysed, it is seen that they are typical of nothing, yet typically organic. It is dangerous to label patients as neurotic when they complain of pain which wakes them at night, and the pronounced periodicity here is strongly indicative of a macroscopic pathological process. What then is the most likely diagnosis in this case? It is a sort of post-cholecystectomy syndrome, and is to be sought for amongst the following: (i) Residual stone in the common bile duct—suggested most by its link with the numerous small stones that had been removed and by the "wriggling about" in the severe attacks. (ii) Common duct damage—the remissions are against this. (iii) Sphincteric dyskinesia. (iv) Recurrent pancreatic œdema. (v) Chronic pancreatitis. (vi) Another disease altogether—either developed subsequent to, or the misdiagnosed cause of, the symptoms for which she was originally subjected to operation. Some features of the symptom complex, for example, suggest strongly that she is suffering from peptic ulcer.

Investigations along these lines revealed that the icteric index was normal and that the serum amylase content just after an attack was not elevated; a barium meal examination revealed no irregularity in the stomach or duodenum, no widening of the duodenal curve and no calcification in the region of the pancreas. Out of deference for previous opinions on the case, and, I suppose, from a sense of insecurity as to the most likely diagnosis, this woman was observed for six months and treated with various conservative remèdies, with varying periods of relief. Then, in a particularly severe attack, it was decided that laparotomy was justified. She was admitted to hospital for common duct exploration and possible transduodenal sphincterotomy. The duct and its opening were found to be normal, but she had a large, chronic ulcer of the duodenum, which penetrated the pancreas to produce an indurated mass involving most of the head of the gland. Partial gastrectomy was performed. She recovered rapidly and has had no pain in the ensuing ten months.

The lesion described here is usually looked upon as simply a penetrating peptic ulcer. It is, however, an example of chronic pancreatitis and is similar in its macroscopic and microscopic pathology to the primary disease. It is of passing interest to note that a carefully conducted barium meal examination failed to establish the diagnosis, and from an operative viewpoint, that radical excision of an ulcer of this type is unnecessary and dangerous. The duodenum may be closed proximally and the ulcer left, in most cases with confidence that it will heal and the secondary pancreatitis promptly resolve. In this instance the duodenum was divided at the oral margin of the ulcer, its free edge was sutured to the aboral margin, and then its anterior wall was sutured to the oral margin, so that the ulcer bed was snugly overlaid by the peritoneal surface of the duodenum and thus excluded from its lumen, after the method of Rudolf Nissen.

L.B., a thin man, aged seventy-two years, presented with gradually deepening jaundice of six weeks' duration. His stools were like putty, his urine was like strong tea, and his skin was commencing to itch. The first sign of this illness had been an attack of severe epigastric pain which came on gradually after a heavy meal and caused him to vomit. The pain was not agonizing and was fairly constant with periodic exacerbations which caused him to "grunt a bit". There had been four or five such attacks, which lasted for several days each, and in all of them there was radiation of the pain to the angle of the right scapula. On examination of the patient there was noticeable liver enlargement, but the gall-bladder was not palpable.

This case is mentioned to illustrate that pain associated with carcinoma of the head of the pancreas is not uncommon. It follows a biliary pattern, and is undoubtedly due to distension of the biliary tree, with or without active contraction of the extrahepatic ducts. Histologically these ducts contain a greatly varying number of smooth muscle fibres (Gray), and it is a not unreasonable postulate that the more muscle tissue present in a duct, the more prone it is to produce a colicky type of pain in response to the stimulus of passive distension. On the other hand, sparse or absent muscle tissue would be associated with a dull, aching or dragging type of pain. However, the presence or absence of pain at all is determined almost certainly by the rapidity of onset of the obstructing process, so that when this is very gradual the classical painless and steadily deepening jaundice is produced.

L.B. was diagnosed fairly confidently as suffering from carcinoma of the head of the pancreas. This was confirmed at laparotomy, together with the presence of metastatic nodules in the liver. The gall-bladder, although tense, was somewhat fibrosed and therefore not greatly distended. Cholecyst-jejunostomy gave relief from jaundice, pruritus and most of the pain, and rendered the remaining six months of his life more or less comfortable.

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SERIAL GASTRIC BIOPSY STUDIES IN A CASE OF DUODENAL ULCER TREATED BY DEEP X-RAY THERAPY.

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Foremost of the physical methods of treatment of duodenal ulcer are those measures directly designed to diminish the acidity of the gastric contents. In the majority of cases regular food and alkaline powders are adequate for this purpose, while at the other extreme is the radical partial gastrectomy which removes the greater part of the acid and pepsin-secreting area of the stomach as well as the pyloric antrum. Intermediate in position is the use of X rays or radioactive materials to reduce the secreting capacity (Palmer and Templeton, 1939; Holman and Lewis, 1941; Ricketts *et alii*, 1948; McGeorge, 1950). Such measures frequently produce achlorhydria lasting several months, thus permitting healing of an ulcer.

It is the purpose of this paper to report a case of duodenal ulcer in which irradiation of the stomach by deep X-ray therapy has been carried out, to comment on the histological changes which have occurred following that treatment, and to present the correlation between the histological findings and the results of serial determinations of hydrochloric acid and pepsin secretion. Single observations on the histology of the irradiated mucosa have been described, the material being provided by biopsy at laparotomy or partial resection of the stomach at varying intervals after irradiation (Ricketts *et alii*, 1948; McGeorge, 1950). The following account is, as far as we are aware, the first report of a study by serial histological and biochemical observations of the complete course of the mucosal reaction to irradiation in the same patient.

No attempt is made to evaluate the place of such a procedure in the treatment of duodenal ulcer generally, although for this patient it has been entirely satisfactory.

Report of Case.

F.B., a labourer, was first admitted to the Royal Melbourne Hospital in 1936 with hæmatemesis and melæna. He was then aged twenty-two years. He gave a history of attacks of burning sensation in the epigastrium one hour after meals, lasting about three weeks and recurring at intervals over two or three years. On examination his hæmoglobin value was 5·0 grammes *per centum*, and there was no abdominal tenderness. He made a rapid recovery in the ward and was discharged from hospital. Prior to his discharge a barium meal X-ray examination showed a deformed duodenal cap.

He remained well till 1944, when symptoms returned. He had further hæmatemeses in 1946 and in 1948, which did not warrant his admission to hospital. Over this period he had relapses lasting up to two months with frequent pain at night and vomiting; he was often unable to work because of the pain. In August, 1949, he was readmitted to hospital because of persisting symptoms for six months and the loss of 14 pounds in weight in that time. On examination of the patient there was no anæmia nor any abdominal tenderness. Three barium meal radiological examinations in the preceding three years had shown a deformed duodenal cap, but only once was there slight delay in gastric emptying. A histamine test meal revealed a maximum free acid level of 102 units, and in an overnight test meal a high level of free acid and large volumes were maintained throughout the night.

Irradiation of the stomach was carried out by Dr. Kaye Scott as follows. The stomach projections on anterior and posterior abdominal wall surfaces were localized by radiographic procedures. The stomach was then treated by anterior and posterior obliquely placed 10 × 20 centimetre fields. Depth dose calculations allowed for the differing positions occupied by the stomach when the patient was prone and supine.

The mean tissue dose prescribed was 1500*r* on the stomach during three weeks, and the skin dose to each port was 1970*r* given in increments of 219*r* per session, one port being treated each day. A beam quality of half-value layer of 2·5 millimetres of copper was used. The focal skin distance was 50 centimetres.

On the twelfth day the patient vomited about four ounces of blood. Brief gastroscopic examination showed no abnormal findings, and the course of treatment was completed without further disturbance. Samples of gastric mucosa were obtained by the biopsy technique previously described (Wood *et alii*, 1949). By this technique fragments of the mucosa, approximately two millimetres in diameter, and usually extending down to the *muscularis mucosæ*, are obtained. The day of commencement of deep X-ray therapy (September 1, 1949) was reckoned as day 1. Biopsy was performed on days 1, 21, 38, 66, 136, 374 and 475.

In the seventeen months following the patient's discharge from hospital he has remained completely free from indigestion and has taken no particular treatment. A further radiological examination nine months after the deep X-ray therapy showed the same deformity of the duodenal cap.

Histological Features.

The biopsy fragments were fixed immediately in 10% formol saline solution. Paraffin sections of the mucosa were stained with hæmatoxylin and eosin, hæmatoxylin and mucicarmine, and a trichrome stain (methyl violet-orange G, Ponceau-phloxine, and methyl green). Technical details of the use of the last-named stain will be described elsewhere (Motteram, 1951).

Our experience with gastric biopsy has shown that vascular and related changes—capillary dilatation, hæmorrhage and œdema — may be produced by the biopsy technique, presumably by the suction involved therein. In the material under review it was considered that the minor vascular changes observed, which showed no close correlation with other histopathological features, may have been due, at least in part, to the biopsy technique, and accordingly they are not considered further. The microscopic findings are represented in Table I and Figure I.

It will be seen that the mucosa on the first and last days of treatment (days 1, 21) was within normal limits (Figures III, IV and VIII).

The mucosal reaction observed in the material of the subsequent biopsies presents two broad features: (i) wandering cell accumulation in the *lamina propria*, associated with changes in the mucus-secreting surface epithelium of the gastric ridges and pits, and (ii) changes in the gastric tubules containing the specific glandular elements, the chief (pepsinogen-secreting) and parietal (acid-secreting) cells.

Reaction of Surface Epithelium and Accumulation of Wandering Cells.—The reaction of the surface epithelium and the accumulation of wandering cells are illustrated in the photomicrographs (Figures V-VII and IX-XI). The following features are worthy of comment. (*a*) The lag of at least twenty-one days after the beginning of the X-ray treatment before a demonstrable reaction occurred in the mucosa. (*b*) The location of the most dense wandering cell accumulation in the superficial (interfoveolar) portion of the *lamina propria*. (*c*) The early, intense and long-sustained polymorphonuclear leucocyte infiltration. (*d*) The relatively slow development of the accumulation of mononuclear cells (lymphocytes, macrophages and plasma cells). (*e*) The long duration of the inflammatory response—a slight but unequivocal reaction was present on day 374, that is, to say, 353 days after the cessation of the X-ray treatment. (*f*) The virtually complete resolution of the mesenchymal cell reaction without fibrosis.

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TABLE I.
Histological Features of Serial Biopsy Samples of Gastric Mucosa.

Histological Feature.	Day of Biopsy.								
	351 Days Before Treatment.	Day after Treatment on which Biopsy was Performed.							
		1	21	38	66	136	283	374	475
Lamina propria:									
Polymorphonuclear cell infiltration	0	0	0	+++	+++	+++	+++	+	0
Accumulation of mononuclear cells (lymphocytes, macrophages and plasma cells)	0	0	0	+	+	++	+++	+	0
Epithelial structures:									
Surface epithelium of gastric ridges and pits:									
Flattening and irregularity	0	0	0	+++	+++	++	++	0	0
Polymorphonuclear cell infiltration	0	0	0	+++	+++	++	++	+	0
Gastric tubules:									
Reduction in number	0	0	0	++	++	+	+	0	0
Irregularity of disposition	0	0	0	+	++	+	+	+	
Presence of mucus-secreting cells in deeper portions	0	0	0	+	++	+++	+++	++	0
Reduction in chief cells	0	0	0	++	+++	++	+++	++	0
Reduction in parietal cells	0	0	0	++	+++	++	+	0	0

Key: 0 = within normal limits.
+, ++, +++ = mild, moderate and gross deviation from normal, respectively.

Reaction of Specific Glandular Cells.—The reaction of the specific glandular cells is illustrated in the photomicrographs (Figures V-VII). While a considerable reduction in chief and parietal cells was evident at day 38, the height of the reaction of the deeper portion of the mucosa was seen on day 66 in this series (Figure VI). By this time the deeper portion of the mucosa showed a gross distortion of the normal architecture, the gastric tubules being greatly reduced in number and irregularly disposed. In contrast to the appearance of the normal mucosa, many of the cells of the tubules were mucus-secreting, only a few chief and parietal cells being present. Subsequent biopsies showed a progressive return of gastric tubules, the parietal cells appearing earlier than the chief cells. The final biopsy on day 475 (Figure VII) showed a mucosa with a content of parietal cells of the same order as that of the pre-treatment specimen and of chief cells slightly, if at all, below normal.

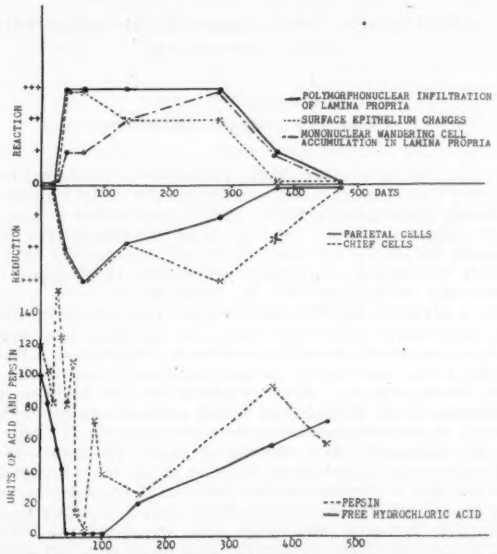

FIGURE I.
Upper graph: Histological features of the reaction of the gastric mucosa to irradiation. Key: Upper portion: +, ++, +++ = mild, moderate and gross cellular accumulation or changes of the surface epithelium. Lower portion: +, ++, +++ = mild, moderate and gross reduction respectively of chief or parietal cells. Lower graph: Maximum free hydrochloric and pepsin secreted during histamine test meals.

Biochemical Findings.

Biochemically the results of treatment could be followed by the use of histamine test meals (Figure I). The largest amount of free hydrochloric acid (102 units) was secreted by the patient on the day prior to the beginning of therapy, and histamine-fast achlorhydria was first shown on the forty-fourth day after treatment and continued until the hundredth day. A gradual increase in the amount of acid secreted was then noted, the last value attained being 73 units on the four-hundred-and-seventy-fifth day after therapy.

Estimation of the pepsin secreted in the specimen obtained one hour after the administration of histamine gave somewhat irregular results, but nevertheless did show a fall with a subsequent rise. A parallel change in the volume and acidity of the gastric juice was shown in the overnight secretion.

Discussion.

From the data presented in Figure I it is evident that a fall in acid secretion preceded any demonstrable mucosal lesion. The further fall in acid secretion coincided with changes both in the wandering cell content of the mucosa and in the number and appearance of the parietal cells. It is clear that achlorhydria was present at a time when parietal cells of normal appearance were present in significant numbers, which is in accord with our general experience that an inflammatory reaction of the mucosa without significant morphological changes in the parietal cells is frequently accompanied by achlorhydria. While there is an obvious correspondence between the return of acid secretion, the restoration of parietal cells and resolution of the inflammatory reaction, the data are considered insufficient to warrant any more precise conclusions. Reduction and return of pepsin secretion roughly paralleled the histological findings, but the correlation is less close than that of acid secretion.

It is considered that the course of deep X-ray therapy is causally, rather than coincidently, related to the observed mucosal changes for the following reasons. Clinically and radiographically the patient presented typical features of chronic duodenal ulcer, and in 29 cases of duodenal ulcer studied in our unit, in which gastric biopsy has been performed, mucosal changes of such an order have never been encountered; 21 of the patients showed a normal mucosa, and the remaining eight a superficial or focal gastritis, usually mild in intensity. Gastric biopsy in this patient 351 days before and at the beginning of treatment showed a normal mucosa (Figures II and

III). The causal relation is supported also by the observations of other workers (Ricketts *et alii*, 1948; McGeorge, 1950).

It remains to consider the related questions of the diffuseness and degree of uniformity of the mucosal reaction to irradiation and the adequacy of the biopsy fragments as representative mucosal samples. Two fragments were obtained at biopsy on four occasions (days 21, 66, 283, and 374), and in each case the two fragments showed good agreement histologically. These findings and the clear trends shown by the curves (Figure I) support the view that the mucosa of the body of the stomach was involved in a uniform and diffuse reaction to irradiation and that the curves presented in Figure I are a valid representation of the broad features of the reaction in this patient.

It is noteworthy that a stimulus applied from the exterior of the body, which presumably was uniform in intensity over the entire depth of the stomach wall, produced a wandering cell reaction predominantly in the superficial portion of the mucosa in relation to the epithelium of the gastric ridges and pits. Similar morphological types of gastritis occur naturally. The above observation enjoins caution in accepting an irritant acting on the surface epithelium from within the lumen of the stomach, as the sole possible ætiological agent of such natural forms of gastritis.

Clinically the appraisal of treatment for duodenal ulcer is rendered almost impossible by its variable natural history. However, in this patient the absence of symptoms in the twelve months after treatment is in such striking contrast with his disability of the twelve months before that we feel that the course of irradiation has been of benefit.

Summary.

1. A case of chronic duodenal ulcer, treated by deep X-ray irradiation of the stomach over a period of three weeks, is described.

2. Serial gastric biopsies were carried out before treatment and then 21, 38, 66, 136, 374 and 475 days after treatment.

3. A profound reaction of the gastric mucosa to irradiation occurred, with subsequent resolution. The course of this reaction over a period of 475 days is described.

4. The findings of serial determination of gastric secretion of hydrochloric acid and pepsin in relation to various stages of the reaction of the mucosa are presented and discussed.

Acknowledgements.

We wish to acknowledge the help received from Dr. Ian Wood, head of the Clinical Research Unit, and from Dr. R. Kaye Scott, radiotherapist, Royal Melbourne Hospital, who carried out the radiation therapy. Mr. Matthaei, of the faculty workshop, University of Melbourne, prepared the photomicrographs.

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Legends to Illustrations.

FIGURE II.—Biopsy 351 days before irradiation therapy. The mucosa is within normal limits. Hæmatoxylin and eosin stain × 130.

FIGURE III.—Biopsy on day 1. The mucosa is within normal limits. Hæmatoxylin and eosin stain × 130.

FIGURE IV.—Biopsy on day 21. The mucosa is within normal limits. Hæmatoxylin and eosin stain × 130.

FIGURE V.—Biopsy on day 38. The superficial portion of the *lamina propria* shows a dense accumulation of wandering cells, predominantly polymorphonuclear. The surface epithelium is flattened and irregular. Gastric tubules are reduced in number, and some of the tubular epithelial cells fail to show the specific staining reactions for hydrochloric acid or pepsinogen secretion. Compare Figures II-IV. Hæmatoxylin and eosin stain × 130.

FIGURE VI.—Biopsy on day 66. There is further reduction in the number of gastric tubules and further loss of specific staining reaction. Trichrome stain × 130.

FIGURE VII.—Biopsy on day 475. There is virtually complete restoration of the mucosa to normal. Compare Figure II. Hæmatoxylin and eosin stain × 130.

FIGURE VIII.—Biopsy on day 21. High-power view of superficial portion of the mucosa shown in Figure IV. The surface epithelium is tall and regular. The wandering cell content of the *lamina propria* is within normal limits. Hæmatoxylin and eosin stain × 550.

FIGURE IX.—Biopsy on day 38. High-power view of superficial portion of the mucosa shown in Figure V. The surface epithelium is flattened and irregular. There is considerable polymorphonuclear infiltration of the epithelium and *lamina propria*. Hæmatoxylin and eosin stain × 550.

FIGURE X.—Biopsy on day 283. An excess of both mononuclear and polymorphonuclear wandering cells is present in the *lamina propria*. Hæmatoxylin and eosin stain × 550.

FIGURE XI.—Biopsy on day 475. High-power view of a superficial portion of the mucosa shown in Figure VII. The surface epithelium is tall and regular, and the wandering cell content of the *lamina propria* is approximately normal. Compare Figure VIII. Hæmatoxylin and eosin stain × 550.

A PATHOGENIC MYCOBACTERIUM ISOLATED FROM TAP SLIME.

By REGINALD WEBSTER,
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EARLY in September, 1939, following a conversation in which I had emphasized the necessity for a rigid adherence to fresh, glass-distilled water in the preparation of reagents to be employed in the cultivation of *Mycobacterium tuberculosis*, enlarging on the affinity of saprophytic acid-fast bacilli for metal and their propensity to frequent tap-water, my technician, Mr. H. Weir, of his own initiative took a scraping of the slime within the mouth of one of the laboratory cold-water taps. He demonstrated clumps of acid-fast bacilli in a Ziehl-Neelsen preparation, a finding which I did not regard as impressive in view of the fact that Schwabacher (1933), working in the laboratory of Professor G. S. Wilson, had found non-pathogenic acid-fast bacilli in the slime coating the inner surface of every one of 56 constantly used cold-water taps. However, at Mr. Weir's request, I subjected the tap slime to cultivation in the manner of the established routine of the laboratory for the growth of *Mycobacterium tuberculosis*; for this purpose a further scraping was made from the same tap with an old scalpel sterilized by heating in a flame to a red glow.

As this story unfolds it will be seen that I eventually found myself in the position of those members of the flock of Oliver Goldsmith's village preacher, indicated in the line, "And fools who came to scoff remained to pray".

Experimental Investigation.

On September 12, 1939, three tubes of glycerinated Petragnani medium were inoculated with deposit obtained after exposure of an emulsion of the tap-water slime to the action of an equal volume of 6% (by weight) sulphuric acid for thirty minutes at 37° C., neutralization by normal soda solution, and centrifugalization at 3000 revolutions per minute for twenty-five minutes. Colonies determined as those of acid-fast bacilli appeared but did not attain macroscopic dimensions until the eighteenth day of incubation, a

rate of growth much slower than that of the acid-fast saprophytes described by Schwabacher (1933) as recovered from cold-water taps. At this stage no significance was attached to the relatively slow rate of growth, which seemed fairly attributable to the retarding influence of an obvious contaminant, present in all three culture tubes.

On October 4 the twenty-one-day growths of acid-fast bacilli and accompanying contaminants were washed from the surfaces of the culture tubes, and five millilitres of the emulsion so obtained incubated for a further thirty minutes with an equal volume of 6% sulphuric acid. The deposit obtained after neutralization and centrifuging was resown on three tubes of Petragnani medium containing glycerin, with resulting pure cultures of acid-fast bacilli, the appearance of which was first detectable macroscopically after thirteen days' incubation; this rate of growth, while slower than that of acid-fast saprophytes, corresponded well with that of *Mycobacterium tuberculosis* in subcultures.

As the cultures developed I became progressively more impressed with their close resemblance to those of *Mycobacterium tuberculosis*. Here was no ordinary acid-fast saprophyte of the type with which I was familiar, making its appearance after two or three days' incubation, indifferent as to whether it was incubated or left at room temperature, exhibiting smooth butyrous growth, bizarre pigmentation featuring yellow, red, or a combination of these pigments in varying proportion, and susceptible of ready and even emulsification in saline solution. On the contrary, the glycerophilic acid-fast microorganism in which by this time I was actively interested did not attain colony formation evident to macroscopic inspection until the eighteenth day of incubation; the pigmentation, which was scarcely appreciable at first, gradually deepened, but did not proceed beyond a buff or "biscuit" colour; the colonies were "rough", friable, well described as simulating bread crumbs, and very resistant to attempts at emulsification. Vigorous shaking of colonies washed from the surface of a culture tube with saline solution resulted in no nearer an approach to a smooth emulsion than a granular suspension in which the larger aggregates of bacteria gradually sank to the bottom of the container on cessation of shaking.

It was fully appreciated, however, that the "smooth" or "rough" character of the mycobacterial colony was a broken reed on which to lean in the identification of a pathogenic strain. Schwabacher (1933) encountered both smooth and rough colony forms in her study of cultures of acid-fast bacilli eventually determined as non-pathogenic, and Pinner (1935) has made his observations on "smooth growing tubercle bacilli", examples of which I have observed occasionally, the subject of an interesting paper.

In all its cultural characters the acid-fast bacillus recovered from the slime coating the inner surface of a laboratory tap resembled *Mycobacterium tuberculosis* too closely to permit of its dismissal as of no significance. When a culture of four weeks' incubation was compared with any of the many cultures of *Mycobacterium tuberculosis* of similar age in the laboratory at the time, it was indistinguishable from glycerophilic, eugonic, human strains of undoubted identity and ancestry.

On December 20, 1939, one millilitre of a suspension in normal saline solution of the tap-slime acid-fast bacillus, of density comparable with that of a staphylococcus emulsion containing 250,000,000 microorganisms per millilitre, was introduced into the circulation of an Australian wild rabbit by intracardiac injection. The effect of this procedure was to determine the death of the rabbit on the thirty-fifth day of the experiment, the microorganism having induced the striking lesions in the lungs and kidneys reproduced photographically in Figures I and II. The lungs of this rabbit hold a place in the museum of pathology of the Children's Hospital to this day, and competent pathologists to whom I have shown the specimen from time to time have without exception identified it as an example of miliary tuberculosis. Whatever the relationship of the as yet unclassified mycobacterium to mammalian tubercle bacilli, it was at all events "tuberculogenic". Specimens for histological study were secured and cultures prepared from a digest in 4% sodium hydroxide solution of a small piece of the thickly studded lung tissue of the rabbit.

The microscopic sections showed the lesions induced to be distinctly "tuberculoid", in that they exhibited an epithelioid cell response, and multinucleate cells, with some of the multinucleate cells surrounded by epithelioid cells in the manner of the "giant cell system". This very suggestive histological appearance is illustrated in Figure III, a photomicrograph of a significant field in a section of the rabbit's lung. In Figure IV is to be seen, under higher magnification, a multinucleate cell enveloped by epithelioid cells. That peculiar manifestation of necrosis, familiar as caseation, and effected by partial autolysis of dead cells and their fusion into a formless and coagulated mass, is well demonstrated in Figure V—a perfect example of miliary caseous pneumonia. Clumps of acid-fast bacilli stained in the lung tissue of the rabbit are shown in Figure VI.

Tubes of Petragnani medium, inoculated on January 24, 1940, with the centrifuged deposit from the lung tissue of the rabbit after its digestion with 4% sodium hydroxide solution for thirty minutes in the incubator, and subsequent neutralization, were examined twenty-three days later (February 16). No growth was discernible by macroscopic inspection, but appropriately stained smears from the surface of a culture tube showed the presence of innumerable acid-fast bacilli. The surface of one culture tube was washed with normal saline solution, two other cultures of the same date and from the same source, the lung of the rabbit, being allowed to progress and eventually attain the characters already described as those of the original cultures from the slime of the tap.

On February 16, 1940, three guinea-pigs were each given an intraperitoneal injection of 0·5 millilitre of a thin suspension in saline solution of acid-fast bacilli washed from the surface of a twenty-three-day culture from the lung of the rabbit which had succumbed to this microorganism, and in death had exhibited the morbid anatomical features portrayed in Figures I and II.

One guinea-pig died seventeen days later, and was found at autopsy to have an unmistakably thickened and infiltrated omentum in which caseating points were conspicuous. Acid-fast bacilli were present in very large number in smears from such yellow points, but no lesions of macroscopic dimensions could be detected in the lungs, liver or spleen.

On the same date, March 4, seventeen days after intraperitoneal inoculation, the second guinea-pig was given a subcutaneous injection of 0·5 millilitre of undiluted old tuberculin. The animal was very ill throughout the following day and was found dead on March 6, within forty hours of the injection of old tuberculin. At autopsy pathological changes were conspicuous and consisted of omental thickening and turgescence, a degree of ascites, and closely set "caseating tubercles" in the liver and in the distinctly enlarged spleen. Similar yellow points were present in the omentum, and smears of such abounded in acid-fast bacilli.

The third guinea-pig of the group was given a subcutaneous injection of 0·5 millilitre of old tuberculin on March 6, nineteen days after inoculation. This animal survived the old tuberculin and when killed on April 2, after the lapse of six and a half weeks, showed local and not extensive "tuberculoid" lesions in the omentum only.

The administration of old tuberculin, by subcutaneous injection, to a guinea-pig inoculated with exudate, discharge or granulation tissue suspected of a tuberculous origin, often serves to reduce by two or three weeks the period of six to eight weeks for which diagnosis is awaited in the usual course of events. The procedure is but an application of Koch's early observation that the severity of the reaction occasioned by the injection of as little as 0·01 millilitre of old tuberculin into a tuberculous and hypersensitive guinea-pig was such as to kill the animal. Experience of large doses of tuberculin as employed to accelerate diagnosis of tuberculosis by guinea-pig inoculation has been recorded by Magath (1934), who recom-

mends intraperitoneal as preferable to subcutaneous injection in the performance of the routine guinea-pig inoculation test for diagnosis. After the lapse of four weeks, to permit of the development of the hypersensitivity which should become manifest in a tuberculous guinea-pig within that interval, Magath injected animals inoculated for the purpose of diagnosis with 0·5 millilitre of old tuberculin by the subcutaneous route. Non-tuberculous guinea-pigs were, as was to be anticipated, unaffected by the injection of tuberculin, but more than three-fourths (78·3%) of

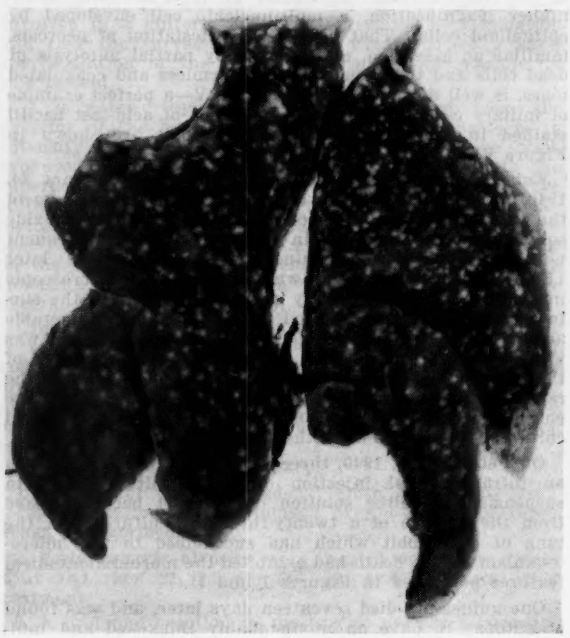

FIGURE I.
Photograph of lungs of rabbit, showing morbid changes indistinguishable from miliary tuberculosis.

guinea-pigs rendered tuberculous by the injection of material submitted for diagnosis were killed within forty-eight hours of the injection of tuberculin, and as the direct result of such injection. The average period of waiting for diagnosis was thus reduced by three weeks; the chance that any animal unaffected by the injection of tuberculin would later be found to exhibit the lesions of tuberculosis was stated by Magath to be 1:30.

On April 3, 1940, four guinea-pigs were inoculated, three by intraperitoneal and one by subcutaneous injection, with 0·5 millilitre of a very thin suspension in saline solution of a culture from the lung tissue of the original rabbit, such culture being then ten weeks old, and having attained its full development as a nodular, friable, glycerophilic and eugonic growth, exhibiting pigmentation of nature and degree strictly comparable with that displayed by contemporaneous cultures of *Mycobacterium tuberculosis*.

The first guinea-pig of this group died naturally on May 5, thirty-two days after inoculation—a rather rapid demise, which, however, permitted the establishment of innumerable tubercles of miliary size in the lungs, liver and spleen.

At 4 p.m. on May 6, thirty-three days after inoculation, the second guinea-pig was given a subcutaneous injection of 0·5 millilitre of undiluted old tuberculin. The animal was very ill throughout the following day, and died during the night of May 7-8, well within forty-eight hours of the provocative injection of tuberculin. Intense local reaction, attended by countless petechial hæmorrhages and resembling a "gravel rash", was noted at the site of injection of tuberculin. The lungs, liver and spleen were heavily sown with tubercles not to be distinguished from those which ensue on infection with mammalian tubercle bacilli. Caseating nodules, in smears from which excessive numbers of acid-fast bacilli were present, were distributed through a thickened and turgid omentum. Miliary tubercles were noted on the peritoneum, and there was much fluid in the peritoneal cavity. An interesting feature of the autopsy was the presence of a hæmorrhagic zone surrounding the individual tubercles in the lungs, a focal reaction

FIGURE II.
Kidneys of rabbit: "tubercles" of miliary size induced by intravascular injection of suspension of acid-fast bacilli cultivated from tap slime.

to tuberculin which, together with the local reaction already described, and the fatal systemic reaction, indicated that the animal had incurred hypersensitivity to tuberculin in full measure.

The third guinea-pig was given a subcutaneous injection of 0·5 millilitre of old tuberculin at 4 p.m. on May 8, the thirty-fifth day of the experiment. The animal died during the night. Again the reaction to tuberculin was attended by petechial hæmorrhages, and again lesions of a tubercular character were thickly studded in the lungs, liver, spleen and omentum, the process in the omentum being accompanied by ascites. A smear from one of the numerous yellow points in the thickened omentum showed the presence of very many acid-fast bacilli.

The fourth guinea-pig was inoculated subcutaneously in the thigh. Twelve days later, on April 15, a lump which had gradually developed at the site of injection broke down and discharged a content which was found to be exceedingly rich in acid-fast bacilli. After the lapse of a further fifteen days, a note was entered on April 30 that the ulcer exhibited

no tendency to heal and that an inguinal gland had advanced in size to become very large.

On May 9, at the end of the fifth week of the experiment, the guinea-pig was given a subcutaneous injection of 0·5 millilitre of old tuberculin; the animal was very ill throughout the following day, refused all food, and whined in a weak manner at intervals. Next day witnessed a decided improvement, and the guinea-pig recovered from the shock occasioned by the injection of old tuberculin; the local cutaneous reaction, however, was of maximum severity, progressing to vesiculation and superficial necrosis.

On January 6, 1941, the guinea-pig died naturally, nine months after subcutaneous inoculation with the acid-fast bacillus recovered after passage, with full pathogenic effect, through a rabbit and derived originally from the slime within the mouth of a laboratory cold-water tap. Throughout this lengthy period the ulcer induced by the subcutaneous injection showed no indication of healing. It appeared that death was due to a recent dissemination from lesions held localized for the greater part of the nine months period to a cutaneous ulcer and associated inguinal adenitis, for at autopsy there was found a process indistinguishable from miliary tuberculosis, heavily involving the lungs, liver and kidneys. A large caseating lymph node was found in the portal fissure, and acid-fast bacilli were demonstrated in a smear made from the caseous detritus found in the enlarged inguinal lymph node in immediate relation to the cutaneous ulcer.

Discussion.

I have endeavoured to describe an acid-fast bacillus, recovered from the slime coating the inner surface of a laboratory cold-water tap, and to show that it was indistinguishable from *Mycobacterium tuberculosis* in cultural characters; that it was highly pathogenic to a rabbit, inducing progressive and fatal disease and lesions which in their macroscopic and microscopic features followed the pattern of those of *Mycobacterium tuberculosis*; that the "tuberculosis" in the rabbit was transferable to guinea-pigs inoculated with a suspension of the microorganism recultivated from a portion of the lung of the rabbit, and that such guinea-pigs manifested an extreme degre of tuberculin sensitivity. It remains to consider to what extent the sum of these attributes warrants the identification of the acid-fast bacillus as *Mycobacterium tuberculosis*.

Cultural Characters.

The cultural characters of the microorganism in question have already been indicated as identical with those of *Mycobacterium tuberculosis*, many examples of which, grown on the same batch of medium and under the same conditions of oxygen supply, were available in the laboratory at the time for comparison. The appearance and behaviour of the microorganism in artificial culture were such as to indicate the summary exclusion of the common acid-fast saprophytes, but it was appreciated that a little more consideration was due to the avian type of *Mycobacterium tuberculosis*. When first isolated from lesions in birds, the avian tubercle bacillus may closely resemble the human, but as a rule, after a few generations in the laboratory, it acquires the capacity for more rapid and luxuriant growth, so that differentiation on cultural grounds alone is rendered possible. Topley and Wilson's well-known treatise (1936) is the authority for the statement that certain avian strains remain permanently like the human type and on solid media indistinguishable from it. The pathogenicity for the rabbit exhibited by the acid-fast bacillus under investigation was comparable with that of the avian type of *Mycobacterium tuberculosis* and approximated that of the bovine, to both of which types of *Mycobacterium tuberculosis* the rabbit is very susceptible; on the other hand guinea-pigs, resistant to avian tubercle bacilli, were very vulnerable to the microorganism which it was sought to identify. The slimy origin of the culture naturally suggested the possibility of a cold-blooded type of tubercle bacillus, but such a contingency would seem to be precluded by the conditions under which it flourished in artificial culture, and the behaviour of the strain in the rabbit and the guinea-pig.

Pathogenicity.

If any demonstrable tissue alterations be regarded as disease, and any microorganisms that cause them as therefore pathogenic, then many acid-fast bacilli commonly regarded as saprophytes, and totally incapable of the lethal effects in animals of mammalian tubercle bacilli, must logically be admitted to the class of "pathogenic" microorganisms; for acid-fast bacilli derived from sources outside the animal body, discharge of excrement therefrom, and in respect of cultural characters "saprophytic", are not invariably without effect in inducing tissue changes on injection into animals. Introduced in appropriate numbers, the non-pathogenic acid-fast bacilli, even such as the grass bacillus, incite a mononuclear cell reaction and the formation of epithelioid cells, giant cells and tubercles. Such distinctive histological response to the implantation of acid-fast bacilli, associated traditionally with the lesions of *Mycobacterium tuberculosis*, has been shown to be intimately related to the high lipide content which is a feature of all acid-fast microorganisms, and indeed confers on them their ability to resist decolorization by mineral acids after having been stained with aniline dyes.

Certain acid-fast bacilli, however, induce in experimental animals lesions of limited extent which partake of the nature of suppurative rather than caseating processes and elicit a predominantly polymorphous rather than a mononuclear cellular response. An important study of chromogenic acid-fast bacilli, other than *Mycobacterium tuberculosis*, is that of Pinner (1935), who investigated 15 strains of atypical acid-fast bacilli; all the cultures except one were obtained from patients who had tuberculosis, or such undiagnosed lesions as were suggestive of tuberculosis. The cultural characters of all—smooth and shiny hemispherical colonies of creamy to viscous consistence, visible after three or four days' incubation, readily emulsifiable and conspicuously chromogenic—were such as to render them ineligible for consideration as type tubercle bacilli. Nevertheless, they were not entirely inert on injection into guinea-pigs; local suppuration, with abscesses tracking through the abdominal muscles and frequently making fistulous openings into the peritoneal cavity, represented the extent of their pathogenicity. The local suppuration usually receded and cicatrized. Small granulomata were often found in the lungs, liver and spleen if the guinea-pigs were killed, and in microscopic sections such granulomata presented a highly polymorphous granulation tissue quite unlike that of tuberculosis. Suppuration rather than caseation was the rule in both local and metastatic lesions.

Obviously pathogenicity is a relative term, the precise meaning of which is difficult to assess unless strictly defined in terms of animal species, dosage and time interval between inoculation and pathological examination; but there can be no obstacle to the admission to pathogenic status of a microorganism such as the present acid-fast bacillus, which in appropriate and not excessive dosage was strikingly tuberculogenic (Figure I) and induced progressive and fatal disease in a rabbit, disease, moreover, which was reproduced in guinea-pigs inoculated with acid-fast bacilli cultivated from the lung of the rabbit. For the initial intracardiac injection of the rabbit I employed one millilitre of a suspension in saline solution of the acid-fast bacilli of density corresponding to that of a staphylococcus emulsion containing 250,000,000 cocci per millilitre. It has been computed by Corper (1933) that one milligramme of tubercle bacillus culture represents in a round figure one billion bacilli. In American usage one billion is 1000 millions, from which it follows that, if Corper's estimate be accepted, 250,000,000 microorganisms is the approximate equivalent of 0·25 milligramme of culture. At all events, in experience gained in the differentiation of 456 cultures of *Mycobacterium tuberculosis* as to human or bovine type, it was a consistent observation that rabbits inoculated in the manner indicated with strains culturally human lived for many weeks, even

months; it was my practice to kill the animals at a convenient time after the lapse of six weeks, and invariably the autopsy showed the sparsely distributed tuberculous lesions induced by the human type of *Mycobacterium tuberculosis* in the rabbit. It can fairly be claimed, therefore, that in determining the pathogenicity of the acid-fast denizen of a laboratory tap for the rabbit, the dosage employed was not excessive.

Tuberculin Sensitivity.

The development of tuberculin sensitivity, as evidenced by severe local, focal and fatal systemic reactions to old tuberculin in guinea-pigs inoculated with the tap-slime acid-fast bacillus, provided no conclusive evidence in itself that the microorganism was a type tubercle bacillus, for the members of the genus Mycobacterium, irrespective of their capacity to induce disease, exhibit a confusing degree of reciprocity in their reactions to "tuberculins" prepared from each other. Of the three individually complex chemical fractions which have been identified and intensively studied in cultures of *Mycobacterium tuberculosis* —proteins, lipides and carbohydrates—the induction of sensitivity of tuberculin type is an attribute of the proteins alone. That all members of the acid-fast genus have much in common antigenically appears from the fact that antisera prepared against the pathogenic mammalian tubercle bacilli agglutinate the widely dispersed non-pathogenic acid-fast bacilli—one of the pioneer observations of Robert Koch which has withstood the critical examination of subsequent investigators. Masucci and McAlpine (1930), in their biochemical studies of acid-fast bacilli, isolated a carbohydrate fraction which they found to be common to a wide variety of pathogenic and non-pathogenic acid-fast bacilli; they showed that a carbohydrate obtained from the non-pathogenic timothy grass bacillus reacted in precipitin tests with antiserum developed against mammalian tubercle bacilli, and conversely, that antiserum prepared against the timothy grass bacillus precipitated an identical carbohydrate extracted from mammalian tubercle bacilli of undoubted pathogenicity and virulence. Arnold Rich (1946) cites the work of Seibert and Morley, who isolated from the "tuberculin" of the timothy grass bacillus a protein substance which elicited hypersensitive reactions in animals infected with *Mycobacterium tuberculosis* of human type.

Thus the capacity to induce sensitivity to tuberculin establishes no more than that an acid-fast bacillus so endowed has chemical and immunological relationship with *Mycobacterium tuberculosis* and is of itself insufficient for its admission to the hierarchy of the genus Mycobacterium, and particularly for its identification with the leading member. Cross immunological reactions and reciprocal sensitization may mean no more than the presence of a similar chemical radicle in the antigenic patterns of the microorganisms concerned, a disappointing reflection in the present instance, in which immunological evidence such as the induction of tuberculin sensitivity in high degree seemed at first to be all that was necessary to establish the tap-slime acid-fast bacillus as *Mycobacterium tuberculosis*.

It is a curious and somewhat anomalous characteristic of the top-ranking mycobacteria that their differentiation must rest on the study of cultural characters and selective pathogenic properties, the human, bovine, and murine types of tubercle bacilli being inseparable by serological methods. Wells (1946), in the course of the investigations which established a place in the sun for the vole bacillus, confirmed the findings of Wilson (1925), Griffith (1925) and others that it is not possible to distinguish serologically between the human and bovine types of tubercle bacilli, but that the mammalian types of tubercle bacilli can be separated serologically from the avian and from the saprophytic mycobacteria. Wilson (1925) found that direct agglutination tests were of little value in the differentiation of individual strains of acid-fast bacilli, and that for this purpose the absorption of agglutinin test was obligatory. Wells showed that suspensions of the vole bacillus absorbed approximately the same amount of agglutinin from sera prepared against human and bovine types of *Mycobacterium tuberculosis* as did the homologous organisms; conversely, suspensions of tubercle bacilli of human or bovine type absorbed approximately the same amount of agglutinin from sera prepared against the vole bacillus as did suspensions of the vole bacillus itself. Thus the close antigenic relationship between the human, bovine and murine types of tubercle bacilli was established.

Undoubtedly absorption of agglutinin tests held promise of determining the place in the genus Mycobacterium to be allotted the pathogenic tap-slime acid-fast bacillus which I have endeavoured to describe. However, such proved beyond my capacity, and the observations here recorded were but brands snatched from the burning in the conflagration which, ignited and maintained by many and urgent bacteriological examinations incidental to the radiological survey of the Australian Imperial Force, enveloped a one-unit hospital routine laboratory. Notes, photographs and microscopic sections were locked away, and the cultures of the acid-fast bacillus, carefully nurtured to that point, soon became submerged in incubators taxed to capacity and died from enforced lack of attention. Even the tap, in the slimy mouth of which the acid-fast bacillus found a congenial habitat, has been dismantled in the post-war reconstruction of the laboratory.

So far as is known, tubercle bacilli do not multiply and maintain themselves indefinitely outside the animal body, a consideration which rendered it improbable that an acid-fast bacillus recovered from a scraping from the inner surface of a cold-water tap could sustain a claim to the exalted station in the genus Mycobacterium preempted by *Mycobacterium tuberculosis*. Serological qualifications, if any, remain undetermined, but at the same time the microorganism in question was of cultural characters poles apart from those usually associated with acid-fast saprophytes and indistinguishable from those of *Mycobacterium tuberculosis*; it was highly pathogenic to a rabbit and seven guinea-pigs and indisputably "tuberculogenic". Pathogenicity for the human subject remains of course an unknown quantity, and it would seem that the most that can be allowed this microorganism is that it was a pathogenic acid-fast bacillus, which resembled *Mycobacterium tuberculosis* very closely though recovered from a situation known to be a happy hunting ground of acid-fast saprophytes. The experience recalls the suggestion of Arnold Rich (1946) that the pathogenic tubercle bacilli have been evolved, by gradual adaptation, from the acid-fast, free-lances so widely distributed in Nature and continually taken into the bodies of animals with their food and drink. Rich suggests further that the chemical and immunological relationships which have been demonstrated between the non-pathogenic and pathogenic acid-fast bacilli indicate that the affinity between the non-pathogenic free living and the pathogenic animal body bound acid-fast bacilli is more than superficial.

Instances of the depredations in human beings of acid-fast bacilli other than any of the recognized types of pathogenic mycobacteria are not far to seek. Noteworthy in this connexion is the comparatively recent report of MacCallum, Tolhurst, Sissons and Buckle (1948) concerning their exhaustive investigation of a group of six patients, all of whom presented with cutaneous ulcers, and in every one of whom the margin of the ulcer teemed with acid-fast bacilli. Clinical, pathological, bacteriological and experimental findings are adduced which establish the ætiological role of the acid-fast bacillus in the cutaneous ulceration, exclude *Mycobacterium tuberculosis* and *Mycobacterium lepræ*, and warrant the presentation of a new mycobacterium pathogenic to man. An instance in which a microorganism, which by all laboratory criteria would have been regarded as an acid-fast saprophyte, stood in apparently causal relationship to disease in the human subject was reported by Beaven and Bayne-Jones (1931), who recovered such an acid-fast bacillus from the pleural fluid of a girl. Investigated by Arnold Branch (1932-1933), this apparently lowly member of the group of mycobacteria was proved incapable of initiating progressive disease in guinea-pigs, even in doses as large as 10 and 20 milligrammes of bacillary substance administered by intraperitoneal injec-

tion. It was found by Beaven and Bayne-Jones, however, that whereas their patient, after recovery from her illness, failed to react to mammalian and avian tuberculin, she was undoubtedly sensitive to a "tuberculin" prepared from her own acid-fast microorganism.

It is difficult also to escape the conclusion that an acid-fast bacillus, other than *Mycobacterium tuberculosis* and in cultural characters a saprophyte, found in large numbers in the sputum of a young woman, and made the subject of a communication by the late Professor S. Lyle Cummins and his associate E. M. Williams, was present in a pathogenic capacity. The "M" bacillus, as this microorganism came to be known, was shown by A. Stanley Griffith to be not without pathogenic effects in rabbits and mice, and Cummins and Williams demonstrated its ability to produce chronic suppuration in inoculated animals and to survive for long periods in the tissues. They described the lesions produced in animals as septic rather than tuberculogenic in type, resembling in this respect the septic pneumonitis in the patient from whose sputum the microorganism was recovered.

Conclusion.

The purpose of this communication is to place on record the detection in the slime coating the inner surface of a laboratory cold-water tap, of an acid-fast microorganism indistinguishable from *Mycobacterium tuberculosis* with respect to cultural characters and the lethal morbid anatomical changes which it induced in a rabbit and seven guinea-pigs. The fact that the acid-fast bacillus was recovered from a situation in which acid-fast saprophytes have been shown to be commonly, it might be said normally, present, rendered it the more arresting. The capacity of the bacillus to induce tuberculin sensitivity does not warrant its identification as *Mycobacterium tuberculosis*, and serological investigation was precluded by circumstances already indicated. It is submitted, however, that sufficient evidence was gathered to establish pathogenicity and a close affinity with *Mycobacterium tuberculosis* in a microorganism derived from a source from which such a devastating pathogen was little to be anticipated.

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Reports of Cases.

A CASE OF MONOCYTIC LEUCHÆMIA WITH CHLOROMA-LIKE TUMOURS.

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THE existence of monocytic leuchæmia as a distinct disease entity has been much disputed. In the section "Monocytic Leucemia and Leucemic Reticulo-endotheliosis" in the "Handbook of Hematology", Downey (1938) described two types of monocytic leuchæmia. The first he called the "Naegeli" type, or a monocytic phase of a myelogenous leuchæmia. Here there is no hyperplasia of the body argyrophilic reticulum, and he considers that the monocytes are probably derived by further differentiation from the primitive and pathological myeloblasts of an acute myeloblastic leuchæmia. The second type he called the "Schilling" type, in which there is a definite hyperplasia of the reticulo-endothelial system, from which free cells are cast off into the circulation and develop into cells of the monocytic series. Other names synonymous with the "Schilling" type of monocytic leuchæmia are leuchæmic reticulo-endotheliosis, reticulo-endotheliosis, reticulosis (Wintrobe, 1946) and leuchæmic sinus reticulosis. Haining, Kimball and Janes (1935) discuss a conception put forward by Ross, who emphasized the difference between the reticulo-endothelium of the blood and lymph channels, and the "sinus reticulum" or "littoral" cells lining the sinuses of the spleen, bone marrow and lymph nodes. The leuchæmic cells of monocytic leuchæmia are derived from a hyperplasia of the sinus reticulum, while the true reticuloses result from a hyperplasia of the former. However, suffice it to say that reticulo-endotheliosis occurs without leuchæmia, but this condition associated with a monocytic, leuchæmic blood picture and clinical manifestations of leuchæmia also exists as a definite disease entity.

The following appears to be a case of reticulo-endotheliosis and monocytic leuchæmia. In addition the post-mortem examination showed the presence of definite tumours, which had many of the characteristics of chloromata, but which lacked their typical green coloration.

Clinical History.

The patient was a labourer, aged forty-five years, married, with two healthy children, and was admitted to hospital on February 25, 1950. He had been well until six months previously, when he began to notice tiredness and loss of energy. This gradually developed into actual physical weakness, and he noticed that he was becoming increasingly pale. Since the onset of his symptoms he had lost approximately two stone in weight. About two months before admission he consulted a medical practitioner, and a blood examination resulted in a diagnosis of monocytic leuchæmia. At this time he was found to be severely anæmic and was admitted to a private hospital. Over the next six weeks he received approximately eight pints of blood by transfusion. While he was in hospital a mild, spontaneous remission occurred, lasting for two to three weeks, during which the leucocyte count returned to normal and there was some clinical improvement. The patient's condition then deteriorated and he was transferred to the Royal Adelaide Hospital. For the preceding week he had been vomiting severely, especially at night, and complained that his feet became swollen when he hung them over the edge of the bed. He had never been unduly short of breath, had had no abnormal bleeding tendency, and had not noticed any rash on his body. He suffered from hæmorrhoids, but they did not bleed, and he had not noticed any glandular swellings until quite recently, when "lumps" appeared under his jaw. His appetite had been quite good until he began vomiting. He had only an occasional slight

cough and had been moderate in his habits as regards alcohol and tobacco. His parents had both died apparently from senility. Apart from a series of boils twelve months previously there had been no recent illness.

Physical examination showed him to be a middle-aged, somewhat emaciated man with a slightly sallow complexion. The nailbeds were of a normal pink colour, and the conjunctivæ and mucous membranes were not pale. The pupils were equal and reacted to light. The fundi were normal. The tongue was moist and clean, and the gums were healthy and edentulous. The fauces and pharynx were covered with thick viscid sputum. There was no venous engorgement of the neck. The trachea was deviated slightly to the right, and there was a visible bilateral, soft, painless enlargement of the freely mobile, submandibular lymphatic glands. Smaller deep cervical glands were palpable on each side, but not in the posterior triangle. In the axillæ and groins there were slightly enlarged, painless, rubbery, discrete, mobile glands.

The respiratory movements were normal and even. The sternum was painful on pressure, particularly over its lower third. The lungs were free from abnormal signs.

The heart was not enlarged. The cardiac sounds were clear and regular, and there were no bruits. The blood pressure was 115 millimetres of mercury, systolic, and 65 millimetres, diastolic. There was no palpable hardening of the arteries.

The liver was enlarged, and the regular, firm edge was felt five centimetres below the right costal margin. The tip of the spleen was just palpable under the left costal margin on deep inspiration.

The cranial nerves and the tendon and cutaneous reflexes were all normal.

The specific gravity of the urine was 1018, the reaction acid; there was no sugar or albumin present.

Investigations.

On February 27, 1950, a hæmatological examination revealed the following: a red cell count of 4,100,000 per cubic millimetre and a hæmoglobin value of 12·1 grammes per 100 millilitres (78% Sahli); the average diameter of the red cells was normal; the volume of packed red cells was 36%; the mean corpuscular volume was 87 cubic microns; the mean corpuscular hæmoglobin was 29·5 micromicrogrammes; the mean corpuscular hæmoglobin concentration was 34%; the platelets numbered 220,000 per cubic millimetre and the leucocytes 75,000 per cubic millimetre. The differential count showed the leucocytes to consist of polymorphonuclear leucocytes 5%, metamyelocytes 3%, myelocytes 1%, lymphocytes 6%, and cells of the monocytic series 85%. The majority of these cells were typical adult monocytes, the peroxidase stain showing a few fine, faintly staining granules. About one-third of them were smaller primitive forms with a similar lace-like but more finely reticular chromatin arrangement in the nucleus, some containing one to three nucleoli and having an agranular, basophilic, pale blue cytoplasm (see Figure I). Downey (1938) mentions the difficulty in identifying monoblasts owing to the different descriptions of these cells by various authorities, and no attempt was made in this examination to differentiate between monoblasts and promonocytes. The red cells were normal.

An X-ray examination of the chest on February 27, 1950, showed a considerable widening of the upper part of the mediastinal shadow, especially towards the left. The scalloped margin on the left side suggested that this was due to the presence of enlarged glands. It was found *post mortem* to be caused by a chloroma-like tumour.

Sternal puncture was performed on February 27, 1950, with the following result: myeloblasts, one seen; promyelocytes, none seen; myelocytes, 2·1%; metamyelocytes, 2·7%; polymorphonuclear leucocytes, 2·2%; plasma cells, 2%; lymphocytes, 5%. The remaining 86% of the cells were of the monocytic series. As in the peripheral blood, adult monocytes were present, but in the marrow there were many more immature forms. These were large cells with irregular nuclei, the chromatin of which was arranged in a reticular fashion, coarser than that of a myeloblast, yet finer than in the adult monocyte. A few contained one or two nucleoli. The cytoplasm was agranular and pale blue, and had a very irregular outline with numerous small pseudopodia. There was only a very occasional nucleated red cell seen in all the smears made, and the marrow contained an unusually small amount of fatty tissue (see Figure II).

Because it was thought that the needle might have penetrated some localized nodule in the marrow, an X-ray photograph of the sternum was taken on March 1, 1950, but no bony abnormality was noted.

A full thickness biopsy of the skin of the palm of the left hand was taken on March 13, 1950, because of an exfoliative dermatitis which had developed on both hands and to a lesser extent on the feet. Examination of the specimen showed slight hyperkeratosis of the epithelium. The corium was vascular and showed an increase of fibrocytes and a few large cells which might have been monocytes. There was no aggregation of these cells and no evidence of leuchæmic infiltration.

Another hæmatological examination was performed on March 10, 1950, when the red cell count had dropped to 3,350,000 per cubic millimetre, and the hæmoglobin value to 9·8 grammes per 100 millilitres (64% Sahli). Reticulocytes were less in proportion than 0·1%, and the leucocyte count had risen to 98,000 cells per cubic millimetre. The differential count showed a similar result to the previous examination, the adult monocytes differing slightly in that they commonly had a "flowery arrangement" of the nucleus.

Clinical Course.

After his admission to hospital the patient's condition steadily deteriorated, with further enlargement of the lymphatic glands and an increase in the frequency of the nocturnal vomiting. There was an intermittent nocturnal temperature rise up to 100° F. throughout his month in hospital. In contrast to the general pallor, the palms of the hands became red and dry, with thickening of the epithelium and deep crevices along the natural crease lines of the palms, from which crevices desquamation commenced. In ten days desquamation was complete, leaving a dry, red, tissue-paper-like skin, from which the biopsy mentioned above was taken. The thickening and exfoliative process then began again.

Some days later he developed diarrhœa, passing up to four loose, fluid stools a day, and he continued to do so intermittently until death.

On March 4, 1950, he complained that his jaw felt as though it had been pushed over to the left side, and on examination he was found to have a right-sided facial paresis of the lower motor neuron type. There were no sensory changes, no loss of taste and no auditory disturbances. The lymph glands in the region of the right parotid gland were slightly enlarged, but it seemed unlikely that there was sufficient involvement of surrounding tissues to account for the paresis.

On March 7, 1950, small, white, ulcerated patches appeared on the posterior pillars of the fauces, but the gums remained healthy.

Deep X-ray therapy to the sternum, thoracic cage and right ear was commenced on March 10, 1950, and seven days later there was a definite decrease in the facial paresis as evidenced by the return of the ability to close the right eye.

The general condition remained unchanged until March 20, 1950, when a purpuric rash appeared over the lower part of the abdomen. From then on there was a rapid deterioration with spreading of the petechial hæmorrhages over the whole of the abdomen, lower part of the chest and arms. The palate and gums showed a few petechiæ just before the patient's death which occurred on March 23, 1950.

Significant Post-Mortem Findings.

The skin of the body generally was pale, but that of the hands and feet was affected by exfoliative dermatitis. There was a small amount of subcutaneous yellow fat. A small number of purpuric spots were observed on the abdomen and arms. The gums showed minute petechiæ on close inspection. The pericardial sac contained about one ounce of straw-coloured fluid with a large "milk patch" over the anterior surface of the right ventricle.

In the mediastinum, attached to the upper and inner surface of the left lung, was a rounded nodular mass about eight centimetres in diameter. The tumour was firm beneath the mediastinal pleura and of a greyish-yellow colour. On being cut, it was found to be friable and blood-less at the periphery with some fleshy, glandular-like tissue deep in the substance.

The submaxillary lymphatic glands on each side were much enlarged, and so also to a lesser degree were adjacent glands. Large lymph glands were present about the cardia of the stomach, and the glands of the mesentery and paraaortic groups were palpable. The inguinal and axillary glands were enlarged as described during life.

The œsophagus was congested and contained a small amount of food, and there was slight œdema of the glottis.

The sternal marrow was hyperplastic and of a uniform dark red colour, as was the marrow at the lower end of the femur.

Both lungs showed congestion of the lower lobes with thick tenacious mucus in the air passages.

The liver was large and heavy, congested and of a reddish-chocolate colour. In the left lobe was a mass about 3·0 centimetres long by 2·0 centimetres wide by 1·5 centimetres deep, which had the appearance of a secondary carcinomatous deposit. The colour was greyish-greeny white, but was definitely not the distinct green colour of a typical chloroma. However, on standing, the cut surface slowly changed colour to become a light yellow similar to the tumour in the mediastinum, and in consistency it was similarly friable and cheesy. Other small masses were found in the substance of the liver with another large one in the right lobe. These tumours were quite sharply demarcated from the liver tissue, but had no separating capsule. The cut surface of the liver had the slightly mottled appearance of an infiltration. The spleen was enlarged and firm and contained another smaller, similar mass in its substance.

The kidneys both had a capsule which peeled easily, leaving a pale surface. The cortex was pale and somewhat swollen, and throughout it and the interpyramidal tissue there was mottling with whitish patches up to five millimetres in diameter, resembling leuchæmic infiltration.

The whole of the small intestine downwards from the jejunum contained necrotic patches up to three centimetres long, occurring eight to twenty centimetres apart. The wall beneath was thickened and infiltrated. In the rectum, just above the anal canal, was an ulcer about 2·5 centimetres across and 2·0 centimetres long, with tissue up to 3·0 centimetres in thickness beneath it, composed of a dense, white material externally and pigmented internally.

All other organs and tissues were macroscopically normal.

Results of Histological Examination.

The histological appearances of the tissues taken for section were as follows.

In the liver there were areas in which the liver cells, stained with hæmatoxylin and eosin, showed cloudy swelling and degenerative changes with much granulation and pale, indistinct nuclei. In other areas the cells appeared normal. The sinusoids were dilated and contained many large, primitive cells with irregular, often indented nuclei. Under a higher magnification the chromatin of these cells was seen to be arranged in a loose, reticular manner within the nucleus, and nucleoli could very occasionally be identified. The cytoplasm, as demonstrated by a polychrome methylene-blue stain, was seen to be abundant and agranular. The cell outline was irregular, and in many cells several small cytoplasmic projections were distinguished. The infiltration with these cells was particularly dense around the interlobular and perilobular vessels, in whose lumina they were seen in large numbers (see Figures III and IV). Wilder's silver impregnation showed some hyperplasia of the reticulum fibrils.

Of particular interest were the sections of the tumour in the liver, which consisted almost entirely of these leuchæmic cells, completely replacing the liver tissue and with quite an abrupt margin between the tumour and the surrounding liver (see Figure V). Beneath the surface degenerative changes were seen, and centrally there was complete necrosis with loss of structure and hyalinization. It was in this tumour that the silver impregnation demonstrated an abrupt change in the quantity and arrangement of the reticulum, indicating that the leuchæmic cells were associated with active reticulum formation, laid down in a dense, irregular, structureless fashion (see Figures VI and VII).

The histological appearances of the mediastinal mass were almost identical with those of the liver tumour. The centre was necrotic and it showed the same structureless reticulum hyperplasia.

The lymphatic glands showed a replacement or a partial replacement of the follicles by similar cells, and the cortical and medullary sinuses were filled with them. The silver impregnation again showed a dense, structureless, hyperplastic reticulum.

In the kidneys there was a generalized infiltration into the interstitial tissue. It was particularly dense around the larger blood vessels, where the tubules had been obliterated and replaced by aggregations of leuchæmic cells. The tubules showed the degenerative changes of cloudy swelling, and the glomerular tufts were swollen.

In the small intestine there was a slight leuchæmic infiltration into the subperitoneal coat. In the two muscular layers a heavy infiltration separated the bundles of muscle fibres. The submucosa was approximately ten times its normal thickness owing to a particularly dense infiltration (see Figure VIII). The argyrophilic reticulum in this layer was extremely dense and hyperplastic (see Figure IX). The mucosa was necrotic.

Sections of the ulcer in the rectum, lung and heart muscle were also examined. They all showed a very dense perivascular infiltration and a generalized leuchæmic infiltration throughout their interstitial tissues. Wherever these cells were to be found in large numbers, there was the same abnormal reticulum formation as was observed in the liver.

Comment.

The term "chloroma-like" tumours was used to describe this case because Brannan (1926) said of the classification of chloroma that "in colourless tumours consisting of myeloid cells, undoubtedly the pathological process is the same as in chloroma, but the unqualified term 'chloroma' should be reserved for those showing a green colour". He also considered it probable that the green colour of these tumours was bound up with the presence of myeloid cells, and he cast some doubt on the earlier reports of cases of lymphatic leuchæmia with chloroma. These may really have been cases of acute myeloid leuchæmia, the primitive mononuclear cells being mistaken for lymphocytic cells. Kandel (1937) in a series of cases also supported this view. Humble (1946) described three cases of chloroma, the first two being associated with myeloid and the third with monocytic leuchæmia. This last case was undoubtedly one of monocytic leuchæmia, occurring in a woman, aged fifty-one years, and the autopsy revealed the characteristic green colour of chloroma in the lymph nodes, pancreas, thyreoid and kidneys. A few tiny green nodules were found in the spleen. The author stated that "the cytology of the marrow was not obviously different from that of other cases of monocytic leuchæmia" which he had studied. However, no mention was made in the histological findings as to whether or not there was any

hyperplasia of the reticulum. In view of the doubt cast on the existence of chloromata in leuchæmias other than myeloid, it seems likely that this case belonged to the "Naegeli" type rather than to the "Schilling" type of monocytic leuchæmia. Another cases of chloroma associated with monocytic leuchæmia was reported by Gump, Hester and Lohr (1936), but this was probably also a monocytic phase of a myeloid leuchæmia. The absence of myeloid cells in the tumours of the case reported in this paper would thus possibly explain the absence of the green colour. Perhaps the term chloroma should not be used at all in connexion with this case, as the tumours were part of the reticulosis, but the similarity is stressed between the collections of leuchæmic cells forming a tumour in the two conditions.

According to Downey's classification, the presence of reticulum hyperplasia throughout the tissues involved, with free monocytic cells in the circulation, leaves no doubt that this is a case of true monocytic leuchæmia of the "Schilling" type, particularly as Downey himself (1938) reviewed a similar case reported by Bykowa (1935), in which there was a tumour in the mediastinum with nodules in the kidneys consisting of small lymphoid cells which were reported as micromyeloblasts. The blood contained 85% of monocytes and monoblasts, and the pronounced reticulum hyperplasia in the location of the tumours was emphasized. Downey considered it to be a case of reticulo-endotheliosis and monocytic leuchæmia of the "Schilling" type.

Forkner (1938) stated that "tumours co-existing with monocytic leukæmia have been described only in a few cases", and excluding the one just mentioned above, only six other cases of monocytic leuchæmia with definite tumour formation could be found in the literature reviewed. This does not include cases of chloroma associated with the "Naegeli" type. One of these six was Case 2 in Forkner's (1934) series, reviewed by Forkner (1938). Here a nodule was found in the rectum and was shown to be a leuchæmic nodule on microscopic examination. Another was a case of Haining, Kimball and Janes (1935), in which there was a similar tumour in the rectum about three inches from the anus; it caused intestinal obstruction. The third and fourth cases were reported by Gittins and Hawksley, and Butt, and were both reviewed by Haining, Kimball and Janes (1935); the first patient was a one-year-old child with bilateral ovarian tumours, and the other had multiple tumours in the pancreas, mesentery, heart, pleura and diaphragm. The fifth case was reported by Campbell, Henderson and Croom (1936), the patient having a thickened ulcer in the rectum and a small localized tumour in the caecum and appendix; this case was probably of the "Naegeli" type of monocytic leuchæmia, and the tumour in the appendix and caecum could possibly have had an inflammatory basis. The last of these cases with tumour formation was described by Rappoport and Kugel (1947); the patient's spleen was removed surgically before the diagnosis of monocytic leuchæmia was ascertained, and at autopsy a small tumour was discovered at the site of ligation of the splenic peduncle; the tumour consisted of monocytic cells.

It is interesting to note that of the seven cases found in these reports in which tumours occurred, in three lesions were present in the rectum, as in the case reported in this paper. The rectum appears to be a common site for ulcerative lesions in cases of monocytic leuchæmia, and similar lesions were frequently described in various reports studied, but the cases had no other features to justify their inclusion in this discussion. The incidence is common enough to warrant rectal examination in these cases. Cutaneous nodules and skin lesions have been commonly reported.

In the opening paragraph of this case report, a brief comment was made upon the division of monocytic leuchæmia into the "Naegeli" and "Schilling" types. The more recent literature tends towards the concept that the monocytes in the "Naegeli" type are not derived from myeloblasts, and that this division is rather arbitrary. Wiseman (1948) stated: "There is little reason to demand visible evidence of reticulo-endothelial hyperplasia in monocytic leukæmia to satisfy the hypothesis that in this disease the monocytes take origin from the reticulo-endothelial system." He considered that hyperplasia of such a tissue probably occurred only when the maturation of these elements was obstructed, and when maturation and cell division occurred uninhibited, the numerical increase was noted only in the end-state cell. As an example of this, the megaloblastic hyperplasia in pernicious anæmia was quoted. When the erythrocyte maturation factor is supplied, this megaloblastic hyperplasia disappears, but the end-state cell, or mature erythrocyte, continues to enter the circulation in large numbers. The possibility was then put forward that the various types of leuchæmia could all be primarily diseases of the reticulo-endothelial system, the predominant cell type being governed by the particular maturative substance which is deficient. The monocytic phase of a myelogenous leuchæmia could then be produced by temporary deficiency in two specific maturative substances in association with the stimulus to the reticulo-endothelial system.

Oberling (1934) described instances of the occurrence, in myeloid leuchæmia, of monocytes appearing in the peripheral blood, which he believed were not derived from the leuchæmic cells in the marrow, but from reticulo-endothelial stimulation elsewhere in the body. He called this "*réticuloses associées*". In contrast to this, Campbell, Henderson and Croom (1936) suggested that the myeloid elements in the blood could be due to an irritative stimulation of the marrow due to monocytic infiltration. In the report of their case, in which a tumour was found at the site of ligation of the splenic peduncle, Rappoport and Kugel (1947) considered that the monocytic cells found in the tumour arose from local mesenchymal, adventitial or reticular connective tissues, and that the origin of the monocytes should be given a broader concept to include other mesenchymal tissues, and should not be restricted specifically to the reticulo-endothelial system. These authors agreed with Baserga (1933), who believed that the presence of myelocytes in the blood did not alter the diagnosis of monocytic leuchæmia, in the same way as the presence of nucleated red cells in myelogenous leuchæmia does not make it erythro-myelogenous leuchæmia. In a histopathological review of a series of eight cases of monocytic leuchæmia, seven of which were of the "Naegeli" type and one possibly of the "Schilling" type, Herbut and Miller (1947) claimed to be able to trace the origin of the monocytes in most cases from the reticulum cells of the reticulo-endothelium. Although Downey's classification of monocytic leuchæmia is still probably the most generally accepted, the concept of Naegeli that monocytes are derived from myeloblasts, and that monoblasts are actually atypical varieties of myeloblasts, is not being substantiated in recent papers, and the idea of a monocytic phase of a myelogenous leuchæmia also gains little support.

Monocytic leuchæmia usually runs an acute course, but Forkner (1938) reviewed a number of cases which had a subacute or chronic course, including one reported by Whitby and Christie (1935), in which two spontaneous remissions occurred of eleven weeks and five months respectively. The case presented in this paper appears to have run a subacute course, existing for approximately seven months from the onset of symptoms, with a slight remission lasting for three weeks.

Summary.

A case of monocytic leuchæmia of the "Schilling" type is reported. The diagnosis is demonstrated by the presence of clinical manifestations of leuchæmia, a monocytic, leuchæmic blood picture, and hyperplasia of the body argyrophilic reticulum.

At autopsy, chloroma-like tumours were found in the mediastinum, the liver and the spleen.

The relation of this to other reported cases of monocytic leuchæmia and chloroma is briefly discussed. Only

seven other cases of the "Schilling" type with definite tumour formation were found in the literature reviewed.

The rectum is a common site of ulcerative lesions in monocytic leuchæmia.

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I wish to thank Dr. E. F. Gartrell, temporary honorary physician and honorary officer in charge of electrocardiography at the Royal Adelaide Hospital, for his permission to publish this report. I also wish to thank Dr. J. M. Dwyer for making the autopsy material available to me, and Professor J. S. Robertson, of the University of Adelaide, and Dr. J. O. Poynton, Director of the Institute of Medical and Veterinary Science, for their help in the preparation and interpretation of the sections.

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Legends to Illustrations.

FIGURE I.—The peripheral blood showing adult monocytes. The "lace-like" chromatin arrangement in the nucleus is clearly seen. (× 1400.)

FIGURE II.—Bone marrow showing immature monocytes (monoblasts and promonocytes). (× 1400.)

FIGURE III.—Section of the liver showing the perivascular infiltration and the infiltration between the liver cords. The lumina of the vessels contain many leuchæmic cells. (× 100.)

FIGURE IV.—Higher magnification of the section shown in Figure III. The dilated sinusoids can be seen containing many leuchæmic cells. The abundant cytoplasm and the irregular and indented nuclei of these cells are shown. (× 550.)

FIGURE V.—Section at the periphery of the large tumour in the liver. The liver tissue is being destroyed and replaced by aggregations of leuchæmic cells. (× 450.)

FIGURE VI.—The argyrophilic reticulum of the liver adjacent to the tumour, as demonstrated by Wilder's silver impregnation. (× 75.)

FIGURE VII.—The argyrophilic reticulum of the liver tumour. The disorganization and hyperplasia of the reticulum are clearly shown. (× 75.)

FIGURE VIII.—Section of the small intestine showing the infiltration into the submucosa. (× 550.)

FIGURE IX.—The argyrophilic reticulum of the submucosa of the small intestine. (× 350.)

REPORT OF A CASE OF ENCEPHALITIS (FATAL) IN A CHILD OF TWO AND A HALF YEARS.

By W. J. LIDDLE.

From the Medical Staff of the Bundaberg General Hospital.

K.L., aged two and a half years, was brought to the Bundaberg General Hospital at 9.30 p.m. on March 6, 1951, with a history of headache and anorexia since midday of the previous day, restlessness, fever, and one attack of generalized convulsions which occurred just before admission to hospital. He had eaten some guavas on the morning of the previous day.

Physical examination revealed the child to be well developed, obviously ill, crying and restless, and to have neck retraction. His temperature was 103·5° F. There were no signs of abnormality in his chest or abdomen. Neck rigidity was very pronounced; the performance of Kernig's test gave rise to a burst of loud crying and struggling. Lumbar puncture revealed crystal-clear fluid under normal pressure. The provisional diagnosis was meningism arising from some indeterminate septic centre, and a course of penicillin and sulphadiazine therapy was begun.

At 1 a.m. it was reported that he had a temperature of 104° F. and had just had a short attack of convulsions. On examination his condition seemed unchanged, and the diagnosis was not altered.

By 9 a.m. the clinical storm had burst, with promise of more to come. The child was cyanotic and having convulsions with both legs extended and pedal spasms as of tetany, clenched hands, clonic regular forceful movements of the right arm, flaccid left arm, and nystagmoid ocular movements. These convulsions soon subsided, but were followed by another attack, which was similar but more prolonged and showed in addition forceful clonic flexion of the right knee, head deviation to the right, and nystagmus with the rapid component to the right.

It was at this point that the diagnosis of encephalitis was first suggested; and shortly afterwards the cell content of the cerebro-spinal fluid obtained on the patient's admission to hospital was reported by the laboratory as two polymorphonuclear cells and eight mononuclear cells per cubic millimetre.

Throughout this second day of the four-day terminal event large doses of sedatives controlled the convulsions, but despite almost continuous reduction-sponging the temperature rose to 105° F. and then 106° F., whence nothing succeeded in lowering it. A white cell count revealed 24,000 white cells per cubic millimetre with 89% neutrophile cells, which immediately put one in mind of the fact that certain acute virus infections, notably those of infective hepatitis and poliomyelitis, may be accompanied in the first thirty-six hours by a high neutrophilia before the delayed rise in the lymphocyte count overtakes it. We thought that acute viral encephalitis would probably do the same; and, could we but have known it then, within forty-eight hours the differential count was destined to change to 52% of neutrophile cells and 48% of mononuclear cells, in an essentially unaltered total count, by which time also the cells in the cerebro-spinal fluid were 13 polymorphonuclear cells and 25 mononuclear cells per cubic millimetre.

However, we began a course of "Chloromycetin" in the hope that whatever small margin of antiviral activity it may have might sway the balance. Shortly afterwards the patient passed in quick succession three offensive stools containing guava seeds. Any hope that the case might be one merely of acute enteritis faded, however, as no comforting fall in temperature occurred, and the child remained comatose and desperately ill. On the third day there was a left spastic paresis and the right side was flaccid. By the evening of the fourth and final day the spasticity was again on the right, but I chanced to be on the spot when suddenly the right side relaxed and the left became spastic. A sinister coldness of the hands and feet, cherry-coloured

cyanosis and rising respiratory rate at the same time heralded the inevitable circulatory failure, and the child died ninety-six hours after the first convulsion.

At the post-mortem examination the only abnormal findings were enlarged pink mesenteric glands and generalized cerebral hyperæmia; there was no abnormality of the salivary glands or bowel. Microscopic examination of the sections of brain (sent to Brisbane) confirmed the diagnosis of encephalitis. The report was as follows:

> In the cerebellum several of the vessels show a moderate degree of perivascular cuffing with mononuclear cells and the overlying meninges are hyperæmic and contain macrophages, round cells and scattered polymorphs. The granular and Purkinje cells appear normal.
>
> In the cortex perivascular infiltration of moderate degree involves both white and grey matter. Focal areas of demyelinization are apparent with which are associated disintegrating nuclei and some microglial proliferation. The overlying meninges have considerable cellular infiltration with round cells. The cellular content of the grey matter is essentially normal.
>
> Pons. Perivascular infiltration is again apparent in both white and grey matter but appears to be more marked in the former. Areas of demyelinization and microglial proliferation are seen.
>
> The histological picture is consistent with meningoencephalitis but the ætiology cannot be determined by sections alone.

The results of blood culture remained negative.

The results of tissue culture and animal inoculation are still awaited.

Discussion.

There are a few facts and inferences which may be worth summarizing:

1. The low early cell count in the cerebro-spinal fluid. Perhaps it is correct to regard as abnormal any polymorphonuclear cells and an increase of lymphocytes above the accepted upper limit of five per cubic millimetre.

2. The early neutrophilia. I do not know what the general belief is with regard to the white cell count of early encephalitis, since this latter is not regarded as at all common and is correspondingly seldom emphasized.

3. The changing pareses and spasticity.

4. The possibility that encephalitis may not be very rare.

5. The probability that early diagnosis may soon become important. In this case diagnosis was accepted within thirteen hours of the patient's admission to hospital, and had it been possible to employ a therapeutic agent effective against viruses, we have the satisfaction of knowing that we should have been in time. It seems reasonable to believe that when this future antibiotic becomes available it will do so in small and expensive amounts, as is the case now with aureomycin and "Chloromycetin"; so that early realiaztion of the need to set about acquiring the drug, especially on the part of hospital staffs in outlying districts, may easily be important. In the meantime an early diagnosis of encephalitis will prepare the physician for a case in which the utmost skilled nursing and supportive therapy will be needed.

Reviews.

ENDOCRINE DISORDERS.

"THE DIAGNOSIS AND TREATMENT OF ENDOCRINE DISORDERS IN CHILDHOOD AND ADOLESCENCE", by Professor Lawson Wilkins, of Baltimore, is a sheer delight.[1] In a handsome large quarto volume he has combined artistry and scientific exposition admirably with superb schemata, charts and photographs. The clinical experience has been gleaned chiefly in the Endocrine Clinic of the Harriet Lane Home during a period of thirteen years and the cases selected for description and illustration as examples of the endocrine disorders have, for the most part, emanated from that model clinic.

The subject is approached in a new way; we learn how to recognize true endocrinopathies and to distinguish their symptoms from similar ones due to constitutional variations in development or to some other cause. To demonstrate this method the air is cleared by a masterly exposition of all known and used diagnostic methods including the appraisement of the physical, sexual and endocrinal development of individuals.

There are three chapters on thyreoid disorders each followed by a generous list of modern references and a magnificent atlas. Chapters follow on dwarfism, variations in the pattern of adolescent development, sexual precocity of isosexual pattern, and sexual infantilism. The tables, diagrams and photographic illustrations and the references are well selected and produced; they enrich the letterpress and leave little to be desired. It would be tedious to refer to this aspect again, for the system extends right to the end of the book. The three chapters on the adrenal cortex are of particular interest because of the modern awakening to the importance of the cortical hormones, which have been isolated or synthesized, in the treatment of a wide range of conditions, some of which have only recently been related in any way to these hormones. Tumours of the adrenal cortex and medulla are described fully and there is a special chapter on heterosexual development which clarifies a notoriously difficult subject. The pituitary gland is similarly treated along with intracranial lesions causing endocrine disorders and followed by a chapter on *diabetes insipidus*. The concluding chapters are on calcium and phosphorus metabolism including parathyreoid disorders and tetany, carbohydrate metabolism and spontaneous hypoglycæmia, obesity and congenital anomalies sometimes mistaken for endocrinopathies. In these chapters there is packed a vast amount of important information on clinical material allied to, but not necessarily belonging to, endocrinology, and they serve to illustrate the hinterland between ascertained and conjectured facts and the shading off of precise knowledge at its periphery, thus providing students with powerful challenges to extend the borders for the future glory of our craft and further benefits to mankind.

The book is an inspiration and its approach to perfection will make practicable some ideas which otherwise must have remained idealistic and relatively unattainable. No medical library will be complete without it and every specialist physician will profit by studying it closely.

[1] "The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence", by Lawson Wilkins, M.D.; 1950. Illinois: Charles C. Thomas. Oxford: Blackwell Scientific Publications, Limited. 11" × 8½", pp. 412, with many illustrations. Price: 95s.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Seven Against Edinburgh", by Muriel Masefield; 1951. London: William Heinemann, Limited. 7¼" × 5", pp. 332. Price: 13s. 6d.

A novel based on fact telling the story of seven girls who wished to qualify in medicine at Edinburgh and had to fight the medical faculty.

"Cancer as I See It", by Henry W. Abelmann, M.D.; 1951. New York: Philosophical Library. 8" × 5½", pp. 112. Price: $2.75.

A book for medical and non-medical readers in which the author discusses the different theories of the causation of cancer.

"Aids to Clinical Pathology: Including Post-Mortem Technique", by David Haler, M.B., B.S. (Honours), London, D.C.P.; Second Edition; 1951. London: Baillière, Tindall and Cox. 6½" × 4", pp. 406, with 22 figures. Price: 8s. 6d.

One of the well-known "Students' Aids Series". The first edition was published in 1944.

"Dementia Præcox or The Group of Schizophrenias", by Eugen Bleuler, translated by Joseph Zinkin, M.D., with a foreword by Nolan D. C. Lewis, M.D.; 1949. London: George Allen and Unwin, Limited. 9" × 6¼", pp. 558. Price: 63s.

This is number 1 of the monograph series on schizophrenia.

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All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: surname of author, initials of author, year, full title of article, name of journal without abbreviation, volume, number of first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

MAN AND HIS ENVIRONMENT.

MOST people are concerned with ecology; some devote time to its study without perhaps knowing it by its name. The Concise Oxford Dictionary states that "ecology" is a variation of "œcology" and this is defined as a branch of biology dealing with the habits and modes of life of living organisms and with their relations to their surroundings. The word comes from the Greek *oikos*, a house. It is thus natural that A. Leslie Banks, Professor of Human Ecology in the University of Cambridge, should choose as the title of his inaugural lecture, delivered at Cambridge in May, 1950, "Man and his Environment".[1] In his opening remarks he quoted from "Devotions upon Emergent Occasions" by Dr. John Donne, who was Dean of Saint Paul's Cathedral in the seventeenth century: "No man is an island, entire of itself; every man is a piece of the continent, a part of the main; if a clod be washed away by the sea, Europe is the less, as well as if a promontory were, . . . any man's death diminishes me, because I am involved in mankind." This is another way of putting the words of Saint Paul that no man liveth or dieth unto himself and that we are all members one of another. Banks thinks that with the passage of years Donne's words have taken on a new or even an ominous meaning; "indeed to-day so much is every man involved in mankind that the ignorance or folly of one may spell disease, disaster or death for many". Jan Christian Smuts wrote that living was an active reciprocal reaction between organism and environment. This, he pointed out, explained not only individual development, but also the existence and development of communities, societies, their histories, phases and climaxes, and all the complexes which we find in the living nature.

When we think of the effect of environment on man we may have in mind individual man or groups of men, in communities or nations or even groups of nations. The distinction is not really valid, for though there may be what we may call mass action and reaction, it is always the individual who is affected, it is always the individual who counts. We know that a man is the product of his heredity and of his environment. Carrel puts the matter clearly when he writes[1] that the laws of heredity merely express the origin of the inherent characteristics of each human being. These characteristics are nothing but tendencies or potentialities. "According to the circumstances encountered by the embryo, the fœtus, the child and the adolescent during their development, these tendencies become actual or remain virtual. And each man's history is as unique as were the nature and the arrangement of his constitutive genes when he was an ovum. Thus the originality of the human being depends both on heredity and on development." If men and women could be mated on a pedigree basis like so many prize dogs and bitches, it would be possible after many generations to produce individuals in whom certain desired characteristics would be manifest, but not even then in every instance. It seems that, human society and its customs being constituted as they are, the geneticists have a forlorn hope when they expect eugenics to bring about a better state of human affairs. But even with the race as it is, we all know and probably have seen what environment and education can do with what may be expected to be regarded as inferior human material. We also know how the brightest human minds may lose their lustre if they are allowed to stray in dark, noisome and sludgy by-paths. Banks in his lecture traced the social history of the people of the British Isles and stated that in a short space of 350 years they had so triumphed over their environment that, in addition to exploring and colonizing much of the earth's surface, they had learned to live healthily at home in a density of 600 people to the square mile. Banks believes that man's interaction with his environment has reached a critical stage. His supremacy over his physical environment is almost complete, but there is one problem in that environment that is unsolved, and that is his relationship with his fellow man. Before we follow Banks any further, it may be well to point out that his contention that Britons have learned to live healthily at home in a density of 600 people to the square mile must not be taken at its face value. To learn how to do something is not always to do it. The conditions in some areas of the Merseyside and at Glasgow in 1939 are described by Richard M. Titmuss in his volume "Problems of Social Policy", one of the volumes of the "History of the Second World War":

> Slum *mores* are consistent with a slum home. Indeed it is optimistic to expect anything else. When one broken-down water-closet has to be shared by anything up to thirty people, and there is no bath and no indoor supply of water; when there is incessant conflict between the need to keep order and the child's natural demand for space; when privacy is impossible and everyone's quarrels, love-making and sexual life are heard or witnessed by children, and when the day-to-day drudgery of the mother is accompanied by a trail of ulcerated legs, carious teeth, hæmorrhoids and backache, the training of children in self-control and in the identification of truth becomes difficult—if not impossible.

While one is prepared to believe that during the last twelve years a great deal of change has been wrought in slum areas, it is unlikely that living has everywhere become healthy. In other words, the nation still needs to practise the lesson which Banks states it has learned. Banks does

[1] "Man and His Environment", by A. Leslie Banks; 1950. Cambridge: The University Press. 5" × 7½", pp. 16. Price: 1s. 6d.

[1] Alexis Carrel, "Man the Unknown", 1936, page 184.

not dwell to any great extent on the question of man's relationship to his fellow man. He does make certain "tentative deductions" from his inquiries. First of all education in the schools should be related to the conditions in which the child is later to live. There is something in this and a great deal might be written about it. One of the troubles is the difficulty of knowing the conditions in which a child may later have to live and work. Secondly, a man is happier if he is a trained craftsman. This is true enough, but of course every man cannot be a trained craftsman. Thirdly, men require leadership if local community life, on which the proper use of leisure depends, is to be retained. Banks's last deduction is that due regard must be paid to man's psychological reaction to his environment and to his need for a spiritual sheet anchor. Here again is a subject on which many words might be written.

In a subject such as this no finality can be reached in a short discussion. All that can be done is to state certain points of view and suggest a line for future thought. Generalities there probably must be. We must therefore accept Banks's conclusion that if man is to have food, a healthy environment and the right to live his own version of "the good life", he must be reasonably sure of peace, order and good government and he must also be taught how to live. In the topsy-turvy world of today such a statement seems almost fantastic. But there it is. Carrel wrote that culture without comfort, beauty without luxury, machines without enslaving factories, science without the worship of matter, would restore to man his intelligence, his moral sense, his virility, and lead him to the summit of his development. This discussion began with reference to the individual; we may come back to him as we always must. Once more we turn to Carrel, who held, and rightly, that it is chiefly through intellectual and moral discipline, and the rejection of the habits of the herd, that we can reconstruct ourselves. "Reconstructed" we shall each be able to do something for the present topsy-turvydom.

Current Comment.

THE EXPOSURE TREATMENT OF BURNS.

ENDURING DEVELOPMENTS in the management of patients with severe burns have related mainly to general measures —control of infection, fluid replacement, combating of shock and pain. Methods of local treatment have been many, varied and often shortlived, being acclaimed and later condemned with equal zest. One form of treatment, said to have been reported on favourably in 1905 and later discarded, has been recently reintroduced and for several topical reasons is of interest; this is the so-called exposure treatment. It is fully discussed in two papers, originating respectively in the United States and Great Britain, that have recently been published together,[1] one by T. G. Blocker, junior, of the University of Texas Medical School, the other by A. B. Wallace, of the University of Edinburgh; both authors are plastic surgeons and have played a prominent part in reviving this particular form of burn therapy. The essential features of the method in its present-day form, as described by Wallace, are the administration of penicillin systemically, full exposure and elevation of the affected part with as much immobilization as is practicable, and abstention from application of all local irritants and any form of local heating. Wallace points out that few surgeons have followed the day-to-day progress of superficial and deep burns treated by "dry" methods, and goes on:

> The clinical picture is at times so unfamiliar as to be almost frightening, yet similar changes must take place regularly under "pressure dressings". The early formation of a scab is of paramount importance, for it protects the wound against the entrance of pathogenic organisms, provides a framework or scaffold for young epithelium, and in deep burns presents a barrier to the loss of protein, salt, and red blood-cells. Thus nothing must be done either to delay its formation or to disturb its integrity. The crust separates from superficial burns within three weeks, leaving a healed surface; with deep burns, after the same interval sloughs must be excised and skin-grafts applied to areas of skin loss.

Details of the method cannot be retailed here—they are fully discussed by both Wallace and Blocker—but particular points may be mentioned. Wallace retains a place in his treatment for absorptive dressings in particular cases, provided always that nothing is done to let the burnt surface become sodden; Blocker appears to use absorptive dressings very rarely, though how much the difference relates to the differing climates of Edinburgh and Galveston, Texas, is not quite clear. Wallace, when possible, cleans the burnt area with 1% "Cetrimide" solution or isotonic saline, snips blisters, dries the surface and applies a lactose-penicillin powder, though he doubts the need for local as well as systemic penicillin therapy; Blocker uses no local application, placing the patient on sterile sheets with the burnt areas completely exposed to the air at room temperature. In essence, however, their local treatment is the same. Both administer penicillin; Wallace considers it essential, Blocker suggests that it could probably be dispensed with in some instances. Both accept the importance of overcoming shock, restoring to normal the circulating red blood cells, and overcoming electrolytic, fluid and protein imbalance, though again there are differences in their approach. The important point is that both are much encouraged by their results. Since June, 1950, Blocker has treated by the open-air method 70 consecutive patients (mostly adults) suffering from burns, many of them of deep second-degree and third-degree type involving 40% to 50% of the body surface. All have been cared for in the open ward without any attempt at sterile technique. He states that they require only small amounts of blood after the initial stage of shock has passed; many with severe extensive burns do well with much less transfusion that would be otherwise needed. They are more comfortable and relatively pain-free after the first few days, whereas previously large doses of morphine were given for weeks. They have a characteristic remission of pyrexia about the end of the first week and avoid a "septic" temperature curve. The clean dry wounds lack an unpleasant "burnt odour". Nutrition is better maintained, stay in hospital is shortened, and fewer skin grafts are needed. Wallace has used his methods for two and a half years, most of the patients being children. He considers that the outstanding feature to justify the change to the exposure method has been the more effective control of infection. In the first 200 cases (that is, for about the first twelve months) cultures were prepared from all burnt surfaces from day to day, but no evidence was obtained of infection with hæmolytic streptococci, *Pseudomonas pyocyanea* or *Proteus vulgaris*; and the burnt surfaces have never become offensive. Blood transfusions have never been required in the second week or later. No loss of appetite or wasting has occurred.

These claims are striking, and no doubt others will want to duplicate them before accepting them; but they cannot be ignored. Criticisms of the method have been offered, but no study of the method with unsatisfactory results has been reported, although Wallace published an account of his technique in 1949. Wallace in his present paper has an answer for many of the criticisms. He denies the allegation that increased nursing is required.

[1] *The Lancet*, March 3, 1951.

He states that chilling of the patient does not occur if draughts are avoided and the ward is kept at an even temperature. Children are stated to be comfortable at the temperature in the wards of the Royal Edinburgh Hospital for Sick Children, which averages 62° to 64° F., although adults tend to prefer a slightly higher mean temperature; absorptive dressings are accepted for the sake of the patient's comfort until he can be admitted to a warmed room, but Wallace warns against overheating and sweating, the local application of heat being particularly undesirable. Elaborate orthopædic fittings are quite unnecessary, Wallace states, and special bed frames are not essential though they are convenient. To the view that the method is not applicable to deep burns, he replies that he has treated many of these by the exposure method, and is satisfied that it is the method of choice for deep as well as superficial burns.

The last point to be brought forward in favour of the exposure treatment of burns is, unfortunately, one of the most important; this is its applicability in warfare of the near or distant future. As Blocker points out, we are faced with a dilemma in considering the treatment of acute extensive burns. On the one hand, we must use every refinement of technique and advance in knowledge of burn physiology and pathology for the benefit perhaps of only a few patients. On the other, in anticipation of possible major disasters, we must try to simplify both general and local therapy. With the possibility of repeated atomic explosions, Wallace reasons, neither the personnel nor the laboratory facilities and supplies of material necessary for "modern" treatment will be available; some other conception of treatment is obviously necessary. Apart from other advantages that are suggested by these reports, notably the control of infection, this method does seem the one most likely to fit in with the circumstances that can be envisaged in the event of war; circumstances involving large numbers of civilian as well as military casualties, with a high rate of burns either alone or with other injuries. In Blocker's view it is the only practical method yet devised of coping with burns occurring on a large scale during the emergency period before reconstructive centres can be set up. Altogether, there are many sound reasons why this method should be taken up and tested by others under controlled conditions. It may not be the best form of treatment in all cases, but it offers a possible solution to certain urgent problems.

SURGERY OF THE STENOTIC HEART VALVE.

A HIGH peak in the surgery of the heart and great vessels, and one of the high peaks in operative surgery generally, is being attained with the development of intracardiac surgery. The conception of this is not new, nor is its occasionally successful application; and in pointing this out and listing the pioneers, R. P. Glover, C. P. Bailey and T. J. E. O'Neill[1] state: "Should valvular surgery of the heart in particular and intracardiac surgery in general become practical, and they have shown every indication of becoming just that, these men deserve a great measure of acclaim for their foresight; their contributions must not be forgotten in the enthusiasm of a presumably new and rapidly developing field." On the other hand, great credit is due to the surgeons who have recently effected brilliant improvements in this field, notable amongst them being R. C. Brock, of Guy's Hospital, London. It is not necessary to enter into details of technique here—they are known to those who are directly interested, and a general description may be found in Glover, Bailey and O'Neill's paper by those who wish to know more—but there is general interest in knowing what has been achieved. The treatment of pulmonary stenosis presents an interesting development in cardio-vascular surgery. For some time now the pulmonary obstruction associated with the tetralogy of Fallot has been overcome in many cases by some type of "shunt" operation which bypasses the obstruction—for example, the Blalock operation (subclavian artery-pulmonary artery anastomosis) or the Potts operation (direct aorta-pulmonary artery anastomosis). Despite the fact that great benefit has followed these operations in many cases, it must be borne in mind that, as Glover, Bailey and O'Neill point out, a form of "patent *ductus arteriosus*" has been artificially created. "Thus an additional (fifth) defect has been added to four already present in the tetralogy of Fallot, albeit one which in large measure overcomes the immediate and obvious effects of the condition under consideration." An attempt at direct relief is therefore reasonable. Brock has achieved success with the operations that he has devised—division of the valve for valvular stenosis and the punching out of a collar of tissue for infundibular stenosis, the approach being ventricular in both cases. Glover, Bailey and O'Neill have performed these operations with modifications of their own in eight cases (four of each). Although they consider it too early to draw conclusions from such a small series, it may be noted that no deaths occurred, immediate and early results were excellent, and the results equalled, even surpassed, those obtained by "shunt" procedures. The ultimate outcome cannot be predicted, but it seems reasonable to regard the operation as sounder than the "shunt" procedures, with their production of a further vascular abnormality.

A direct approach has also been made to the affected area of mitral and aortic valve stenosis with encouraging results. For mitral stenosis Glover, Bailey and O'Neill have used the procedure that they have called commissurotomy. This involves surgical separation of the individual anatomical valve leaflets and is claimed to restore a considerable degree of valve function without the production of additional significant regurgitation—a serious and sometimes disastrous defect in most previously used procedures. Division of the commissure is carried out with a guillotine knife on the tip of the operator's finger, the approach being through the left auricular appendage; it is followed by gentle dilatation of the opening with the finger. Glover, Bailey and O'Neill have performed this operation in 50 cases, with eight fatalities; three fatalities were due to faults of technique when the procedure was being developed, and the other five to "inadvertent but improper management of the valve itself" with production of immediately recognizable regurgitation at the time of surgical intervention. One patient died from a respiratory tract infection four months after an apparently successful operation. The remaining 41 are living and well, 20 with excellent results and 21 with improvement. There has been no return of the stenotic state detectable clinically or physiologically in two early cases followed for a period of two and a half years or in any more recent cases.

Procedures for the relief of aortic stenosis are less advanced. Glover, Bailey and O'Neill refer to the possible surgical approaches which they and others have explored experimentally. They consider dilatation of the valve the surgical treatment of choice at present, and have devised a blunt-pointed instrument which they introduce through the right common carotid artery; when it is in the lumen of the stenosed valve a dilating mechanism is brought into play and the cusps are gently dilated to or past the point of commissural separation. Results obtained are encouraging in the two cases in which this has been used, but no conclusions can be drawn. The solution of the problem of aortic stenosis is not yet found, even the suitability of an aortic or a ventricular approach being still conjectural. However, we may justifiably be hopeful. The results of intracardiac surgery reported in this paper (reinforced by a brief statement of more recent work in an addendum) stand with those of a growing number of other surgeons who with skill, ingenuity and respect for first principles are overcoming the anatomical, physiological and pathological problems that dominate the surgical approach to the relief of disability due to cardiac valve lesions.

[1] *The Journal of the American Medical Association*, November 25, 1950.

Abstracts from Medical Literature.

DERMATOLOGY.

Granuloma Fissuratum Healed by Penicillin Troches.

C. MOPPER AND J. R. ROGIN (*Archives of Dermatology and Syphilology*, November, 1950) state that *granuloma fissuratum* was distinguished as a clinical entity by Sutton, junior, who described it as a circumscribed, firm, whitish, fissured granulomatous new-growth occurring in the labio-alveolar fold. The lesion is discoid, smooth, rounded and slightly raised, being approximately a centimetre in diameter, lacking an inflammatory areola, and folded similarly to a bent coin, so that the fissure in the bend is continuous at both sides with the labio-alveolar sulcus. Most text-books emphasize the necessity for destructive procedures, so the authors thought it worth while to report the successful use of penicillin troches. They state that in future cases conservative treatment should be tried before destructive methods are instituted.

Verrucæ: A Dermatological Problem.

C. W. LANE (*The Journal of the American Medical Association*, December 16, 1950) discusses four types of warts: *verruca vulgaris, verruca plana juvenilis, verruca plantaris* and *verruca acuminata*. He gives his personal experiences and preferred therapy. Psychotherapy has failed almost universally in his experience. He states that in *verruca vulgaris* local destruction is the method of choice. For small warts electrodesiccation with or without local anæsthesia is the best treatment. Larger warts are seared with the actual cautery, and the seared covering is removed with a curette; a soft, red, gelatinous base is revealed, which is destroyed down to firm tissue with the same cautery. For warts around the nail and beneath it, the overhanging nail plate should be trimmed to obtain complete exposure, and a superficial application of monochloracetic acid made, followed immediately by the application of a 40% salicylic acid plaster. This is kept in place for a week. When the plaster is removed, the soft necrotic tissue is removed with scissors and an antiseptic ointment is applied. If pain is severe, the plaster should be loosened or removed and compresses of boric acid applied. For multiple *verrucæ vulgares* in young children, mercurous iodide is prescribed along with the topical application of salicylic acid (20%), resorcinol (10%) and mercury bichloride (1%) in alcohol (95%). This is applied twice daily into each wart on a pointed toothpick. *Verruca plana juvenilis* has proved resistant. It occurs predominantly on the face of children. The author has had most success from mercurous iodide or arsenic trioxide given internally, combined with small doses of Röntgen radiation (44*r* to 66*r*) once a week for four weeks. Other workers have reported success with the local use of Fowler's solution. For *verruca acuminata*, podophyllum (20%) in alcohol (95%) should be applied into the crevices of the wart without being allowed to spread to the surrounding areas. It should be washed from the skin within seven or eight hours, as it may cause œdema, redness, ulceration and pain. Facial lesions should be treated cautiously, as podophyllum, if it comes in contact with the eye, can cause severe conjunctivitis. Plantar warts are treated by irradiation (1500*r*) closely shielded with lead. The patients should be warned that if this treatment does not cure the wart it is not radiosensitive, and that they should never allow anyone to give additional irradiation (with either Röntgen rays or radium) to that particular area. The mosaic type of plantar wart should be pared down and monochloracetic acid applied, followed by a 40% salicylic acid plaster. This is done at weekly intervals, provided that the previous treatment has not produced severe pain. For multiple warts of the feet of plantar, mosaic and *vulgaris* types, a 5% aqueous solution of formalin is applied. The patient should be warned to be on the lookout for possible sensitivity, and the treatment should be stopped if erythema or burning occurs.

Protein Deficiency in Cutaneous Disease.

W. B. GUY (*Archives of Dermatology and Syphilology*, February, 1950) states that in a previous presentation he and his associates made observations on patients past middle life, who presented varying degrees of œdema of the legs below the knees, with chronic erythematous, papular, vesicular, pustular, exudative or squamous inflammation of the skin involving the same areas. In these patients cardiac decompensation and renal disease were not found, and varicose veins of sufficient degree of severity to cause œdema were not present. The author suspected deficiency in serum proteins and found in many instances a decreased total serum protein content with reversal of the albumin-globulin ratio. This deficiency in aged persons was due to several factors—poor dentition with attendant low intake of meat, sketchy dietary habits of many elderly people, anorexia, and impaired assimilation of proteins that were ingested. The author now proposes that such cutaneous changes can occur from protein deficiencies due to reasons other than those that operate in the aged, and further that protein deficiencies can influence the course and prognosis of other cutaneous conditions. The plasma proteins, albumin, globulin and fibrinogen, are the proteins that maintain the balance in osmotic and hydrostatic pressure between the circulatory blood and tissue fluids. The so-called normal levels of these three plasma proteins are as follows: 0·27 gramme of fibrinogen, 2·7 grammes of globulin and 4·1 grammes of albumin per 100 millilitres, making altogether 7·1 grammes of protein per 100 millilitres. The approximate ratio of the three fractions is 1:10:15, the albumin-globulin ratio being 1·51:100. Reduction of the level of these proteins in the circulating plasma is one of the main causes of clinical œdema. Albumin is the most important of the three in this osmotic effect. Formerly, the critical level of œdema was considered to be 3·0 grammes of albumin per 100 millilitres, but according to Stare and Davidson this may be modified by certain situations, such as the presence of anæmia, and œdema may occur with levels greater than this. Some persons with plasma proteins slightly below the lower levels of normal may have œdema. This fact is due to postural effects, salt and fluid intake, anæmia and environmental temperature. A diagnosis of protein deficiency does not depend on the finding of a low total serum protein content or a reversal of the albumin-globulin ratio. Further, protein deficiency, with resulting clinical cutaneous manifestations of the type the author mentions, can be conceived as occurring in a person of middle age or younger because of improper synthesis of plasma proteins by a diseased liver. The author demonstrates this point with illustrative cases. In addition to the direct effect of protein deficiency in the cutaneous manifestations of the cases discussed, the author draws attention to its contributory effect in others; for example, decubitus ulcers in bedridden patients are associated with hypoproteinæmia.

Treatment of Acne with Sulphur Lotion.

NORMAN M. WRONG (*The British Journal of Dermatology and Syphilis*, December, 1950) states that 125 unselected university students with acne were treated with a special sulphur preparation having the following formula (in parts by weight): sulphur, 7·5; sodium mixed alkyl benzene sulphonate, 110; antipyrene, 54; triethanoiamine, 100; propylene glycol; 560; water, 168·5. Fifty-seven of these patients were followed for over three months or longer; 75% of them had moderate or excellent improvement at the end of three months. No severe reactions suggestive of a true sensitivity occurred in any of the patients. A reaction occurred within the first two weeks in some patients, but disappeared in a few days. There were no other changes in treatment made during this time, and especially no use was made of X-ray or lamp treatment, or of dietary, vaccine, hormone or vitamin therapy.

Pemphigus Vulgaris.

F. C. COOMBES AND O. CANIZARES (*Archives of Dermatology and Syphilology*, December, 1950) review 100 cases of pemphigus, consisting of 82 of *pemphigus vulgaris*, seven of *pemphigus vegetans*, nine of *pemphigus foliaceus* and two of *pemphigus erythematosus*. They state that the initial lesions appeared most frequently in the mouth; the scalp, abdomen and chest, in that order, had the next most frequent involvement. Blood counts, sedimentation rate determinations, and studies of blood chemistry were found to be of some value in diagnosis. A highly nutritive diet and good nursing care are essential, but there is no specific treatment. With carbarsone as good results were obtained as with antibiotics. The latter substances probably act only in controlling infection. Cortisone deserves further evaluation.

Formaldehyde in the Treatment of Warts.

F. W. LYNCH AND I. M. KARON (*Archives of Dermatology and Syphilology*, December, 1950) state that it is probably general experience that multiple plantar or periungual warts are particularly likely to resist common therapeutic methods, and for this reason they employ formaldehyde more com-

monly for such cases. Unfavourable reactions have not been common and generally consist in discomfort from cracking and fissuring of warts hardened by the formaldehyde. Such reactions are controlled by the frequency of the applications. The authors advise against using formaldehyde ointment elsewhere than on the hands and feet. Condylomata should not be treated with the ointment. The majority of the authors' patients have been given 15 grammes of a mixture of three or four millilitres of formalin in "Aquaphor". The ointment is applied with a cotton-tipped applicator and gentle friction and without dressings twice daily for a week or two and then once daily, or once or twice in three days, so that "hardness" of the warts is maintained. The surface of the lesions is shaved every week or two, usually by the physician. Rarely is treatment successful in less than four weeks.

UROLOGY.

Post-Caval Ureter.

R. O. OLSON AND G. AUSTEN (*The New England Journal of Medicine*, June 22, 1950) report a case of right post-caval ureter, bringing the total number of cases so far reported up to 39. They state that this is the fifth case in which a correct pre-operative diagnosis has been made, the eleventh in which plastic repair of the anomaly was attempted, and the ninth in which a successful result has been obtained. A study of the embryological factors will explain why the right ureter sometimes passes behind the *vena cava*. How often this happens is not known, but when clinical attention is drawn to it there is a variable degree of chronic obstruction, with resultant hydronephrosis, hydroureter and calculus formation. There may be pyrexia and hæmaturia. In one-fourth of the 39 cases so far reported there were no symptoms at all, the diagnosis being made by radiological study. Most often the portion of the ureter behind the *vena cava* is unhealthy or constricted and has to be excised for this short length with subsequent end-to-end anastomosis of the duct laterally to the *vena cava*. Any procedure which involves severing of a ureter, with some degree of transplantation of a duct, is subject to complications arising from interference with the blood and nerve supply. Also there is the danger of late stricture-formation at the site of the anastomosis. Unless care is taken to leave intact the investing layers of the duct, there is danger of faulty healing, or actual necrosis, at the site of anastomosis. With division of the ureter, the continuity of the intramural plexus of nerves responsible for peristalsis is interrupted, and may thereby leave the distal segment of the duct incapable of any function except maintenance of local tonus. Lowsley suggested division of the duct near the bladder, withdrawal of the entire ureter upwards so as to free the ureter from its post-caval site, and then reimplantation of the ureter into the bladder. This preserves nerve contiguity, but interferes with blood vessels coming into the duct from the vesical arteries. It also depends on the post-caval portion of the duct being open and healthy. The latter objection also applies to the suggestion of Harrill that the distal portion of the renal pelvis be cut across and the reimplantation be done there. The ureter may be reanastomosed end-in-end, end-to-end by serosal suture with inversion of edges, or finally end-to-end with mucosal suture and eversion. The first two methods have been used for years, but show a serious tendency to stricture formation, while the third method has not had sufficient trial. The authors prefer no splint in the ureter, and a pyelostomy drain (Foley 18F catheter) for eleven days.

Tumours of the Adrenal Gland.

G. F. CAHILL AND M. M. MELICOW (*The Journal of Urology*, July, 1950) have had the opportunity to study over 100 cases of disturbance of the adrenal gland. In about one-half of the cases the patients had portions of one or of both glands, or one entire gland, removed and studied. Some cases were found at autopsy. The authors review and classify syndromes associated with hyperfunction and dysfunction of the adrenal gland. They state that the hypercorticism of the adreno-genital syndrome is probably the antithesis of the hypocorticism of Addison's disease, but the clinical picture is modified by special features. Cushing's syndrome (cortico-metabolic) is probably dyscorticism with elements of hyperfunction and hypofunction. The classification is as follows: (*a*) Cortical. (i) Non-hormonal tumours, which are unimportant, and remain asymptomatic until large enough to cause pain. (ii) Cortical hyperfunction, which usually causes an excess of androgens. In infancy, this generally superimposes maleness on a basically female individual, resulting in pseudohermaphroditism. Males before puberty develop macrogenitosomia, and later dwarfism. Young adult females develop virilism or the cortico-androgenic syndrome. Diagnosis is based on the history, clinical appearance, perirenal pneumograms and assay of the urinary 17-ketosteroids. In operative specimens cells resembling those of the reticular zone (granular) are found. (iii) Cushing's syndrome (cortico-metabolic), which is a definite clinical entity, characterized by asthenia, obesity, hypertension and osteoporosis. The disease is serious, and the patients affected are poor operative "risks". The histological appearance is characterized by masses of large "foam" cells. (iv) Combined syndrome, in which the cardinal symptoms of (ii) and (iii) are equally prominent. (*b*) Medullary. (i) Sympathicoblastomata, which tend to occur in children, and are highly malignant. The adult type of tumour, the ganglioneuroma, is benign. (ii) Pheochromocytomata, which develop either in the adrenal medulla or along the route of the sympathetic ganglia (extramedullary pheochromocytoma). Benzodioxane, injected intravenously, causes a distinct but temporary decrease in the hypertension of this disease, but does not affect other types of hypertension.

Injuries of the Ureter in Pelvic Surgery.

E. P. NICELEY (*The Journal of Urology*, August, 1950) states that ureteric injury is fairly common in gynæcological surgery. Many unilateral ligations are not recognized at operation, but are diagnosed later when the ureters are catheterized. When complete anuria follows extensive pelvic surgery, occlusion of both ureters should be suspected rather than a diagnosis made of suppression of urine; inaction then leads to the death of the patient. In such a case, when the patient's condition is grave, bilateral nephrostomy is a life-saving procedure. After attempts at ureteric catheterization with filiforms have failed, open operation with transperitoneal deligation may prevent further damage to the kidney.

Teratoma of the Testis.

C. P. GRAY, G. J. THOMPSON AND J. R. MCDONALD (*The Journal of Urology*, November, 1950) present the findings in 127 cases of teratoma of the testis. They state that the outstanding facts are that tumours of this type occurred in an earlier age group than did the seminomata, they were fast-growing, they metastasized early, and they were very malignant, as shown by the fact that 80 patients died within one year of commencing treatment. All patients with testicular tumours should have hormone evaluations carried out, since 5·5% of the teratomata in this series had chorioepitheliomatous elements in them. Even though a patient has definite metastatic lesions, however, a prognosis of inevitably early fatal outcome is not inescapable, since four such patients in the authors' series lived for more than 10 years after orchidectomy and radiotherapy.

Studies on the Nature of Urinary Calcium.

H. H. FLOCKS (*The Journal of Urology*, November, 1950) states that, in contrast to cystin and uric acid lithiasis, the pH of the urine is not the most important factor in the production of urine which will keep calcium salts in solution. In the study of factors in this problem one must consider urinary calcium precipitability and the use of ion exchangers. The study of these factors shows that infection is an extremely important factor, far more important than the pH, and that substances are present in the urine which form soluble complexes with the calcium, and are negatively charged.

The Production of Epididymitis.

R. S. GRAVES AND W. J. ENGEL (*The Journal of Urology*, October, 1950) propose a conception of epididymitis which does not embrace bacterial invasion. They claim that normal sterile urine can, and does, find its way into and along the *vas deferens* and finally causes an inflammatory reaction normally confined to the tail of the epididymis. The prostatic part of the urethra, into which the ejaculatory ducts open, is the widest and most dilatable portion of the urethra. If, because of increased intraabdominal pressure, urine is forced from the bladder into the prostatic part of the urethra without relaxation of the external sphincter, the prostatic part of the urethra becomes acutely dilated. Then, a small quantity of urine may become forced into one or both ejaculatory ducts. Inflammation of the tail of the epididymis may follow in a few hours. These observations have been made during experiments on dogs.

British Medical Association News.

SCIENTIFIC.

A MEETING of the South Australian Branch of the British Medical Association was held on March 29, 1951, in the Verco Theatre, Institute of Medical and Veterinary Science, Adelaide, the President, DR. C. O. F. RIEGER, in the chair.

Medical Education.

PROFESSOR A. A. ABBIE read a paper entitled "The Academic Aspects of Medical Education" (see page 817).

DR. K. STUART HETZEL, in opening the discussion, said that over the years they had been adding to the content of the medical course because of newer knowledge and the advance in concepts of disease, newer methods in diagnosis and treatment, but they had not shorn the course of much of the older material because it had been considered that much of it was basic knowledge and still necessary. The result was that the curriculum was too full, and certainly they could not add more. He considered, however, that by proper integration of all the subjects in the preclinical and clinical years, it might be possible to save up to six months in the six-year medical course. By integration he meant seeing that the preclinical subjects bore a close relationship to the clinical years, and that the student, having passed anatomy, biochemistry and physiology, did not then put his books on the shelf and feel that these examinations having been passed, these subjects were only distantly related to his further studies in the clinical years. However, with such curtailment and integration sight must not be lost of the necessity of a good basic knowledge, especially for those who later wished to proceed to higher degrees and specialities—this, in spite of the fact that the medical course was mainly concerned with instruction to the level of the general practitioner, who formed the larger proportion of graduates in medicine. With the six months of formal instruction saved in this way he would like the student during this time to take an active part in the work of the wards, as a rotating assistant, house physician and house surgeon. The policy of the medical schools was eventually to insist on a period of hospital residence before registration, but because of the large numbers passing through the medical schools that had not been possible, and it did not look as if it would be possible for a number of years. Such a scheme might help to some extent, especially if, as an addition, a system of apprenticeships was established whereby new graduates could serve as assistants in general practice in selected practices and group clinics. Those vacancies of necessity would have to be recurring. Such increased facilities in the practice of medicine and surgery would improve the standard generally. All were convinced of the value of such practical experience under supervision, and the tendency abroad was to use apprenticeship in some way more and more. In the Adelaide school they had taken pride in their clinical facilities and instruction, but of recent years that had not obtained to the degree they would like because of the increased number of students, and individual instruction had not been possible with over 100 students in each clinical year. The incorporation of the general practitioner in such a scheme would keep him in touch with the medical school, from which he would continue to get help, as the school would expect help from him. That would result in benefit to both. It certainly would help up to half of the graduates, who could not hope to get in the normal way a period of residence in the school in which they received their medical training.

DR. P. S. MESSENT said that in the few minutes available to him he would attempt only to mention a few aspects of the medical course which could be improved. Firstly, he considered that an endeavour should be made to remove the present sharp division of the course into pre-clinical and clinical years; the early years should cease to be a series of obstacles which had to be surmounted before the clinical work could be commenced; there should be more emphasis on the fact that the information gained in those early years was the essential foundation for the work of the subsequent years. Secondly, Dr. Messent said, if their object during the clinical years was to teach the students to apply the knowledge gained in the early years to the problems of patients, it was surely essential that the "factual content" of the courses in the early years should be within the capacity of the average student to assimilate. What mattered was how well each student had mastered and remembered the basic principles of those subjects. It would seem evident to most teachers that throughout the course they attempted to teach too much detail. The third point was that during the "clinical years", as much time as possible should be spent by the student in examining and carrying out necessary investigations on his patient. He should be encouraged to attempt the solution of the clinical problems by a methodical application of the information he had gained in the pre-clinical years. Above all he should be encouraged to question, to inquire; the idea should be fostered that any might do some "clinical research" if they had the keenness and enthusiasm.

DR. JOHN L. HAYWARD expressed appreciation of Professor Abbie's interesting and provocative address, and agreed with his main thesis that the primary function of a university was that of education rather than the mere imparting of information and technological training. In assessing the relative success in this field of full-time academic teaching and that of part-time teachers, he wished to point out that it was the experience of most clinical teachers that when students arrived at the hospital after three years of academic teaching, their education, as judged by their capacity to think, had not progressed very far. He felt that while there was certainly need for academic teachers of high standing and reputation, who could keep a student's head in the air, there was need also for teachers of lesser degree who could keep his nose to the grindstone. Teaching was only one phase of medical education, its counterpart was learning, and that required certain positive qualities in the student, such as application, diligence and practice. There was a general tendency to swamp students with information rather than to train them in the acquisition of principles and method; such training involved the rather tiresome processes of all elementary teaching—precept, practice, and the correction of error—and was much less interesting than didactic teaching by lectures and ward rounds. Students themselves came to feel that they had only to stand about and listen long enough to acquire sufficient information to "get through". In effect the teachers spent the bulk of the student's clinical years trying to teach him post-graduate medicine, so that the unfortunate graduate, if he was ever to become a useful doctor, must spend the bulk of his early post-graduate years learning undergraduate medicine.

DR. J. S. COVERNTON said that he was very interested in the suggestion of Dr. Hetzel on the advisability of reintroducing the apprentice system. He considered that that would go some distance in the integration of teaching both undergraduate and post-graduate. It was imperative that a closer liaison should exist between the practitioner outside the hospital and the medical school. That should be both on the academic side from the university to the school of experimental medicine and on the practical side from the hospital in the teaching of diagnostic techniques and aids to treatment. The introduction of some form of apprenticeship would achieve for the tutor principal a measure of that close association and would act as an incentive for him to continue study. By so doing he would be able to consider the many problems so frequently put forward by thoughtful physicians which could not be elucidated by hospital practice alone. That those problems were important had been shown by such eminent men as Spence, Pickles and Sheldon. Many problems in obstetrics, geriatrics and pædiatrics were much better tackled from general practice. Many living as they did in relatively small communities, Dr. Covernton considered that it should not be impossible to achieve some important result and thus elevate general practice in the eyes of students and public. The student on the other hand would achieve valuable experience in early manifestations of disease and epidemic disease, as well as acquire the necessary attitude of mind towards sick people which was lacking in the impersonal hospital atmosphere. Dr. Covernton believed that this project was practical and could be achieved by consideration and consultation.

DR. H. A. MCCOY supported Professor Abbie in his plea for adequate remuneration for all teachers of medical students. He said that the post-graduate teaching facilities offered under the scheme of apprenticeship suggested by Dr. Hetzel provided a subject for interesting discussion and in the main he supported the principle.

DR. P. S. WOODRUFF said that a number of interesting points had been made about the content of medical teaching. He would like to raise the subject of the quality of teaching, particularly clinical teaching. Few clinical teachers had had the opportunity for training in teaching methods and technique. Some had a natural gift for teaching, but for the majority there was much that could be learnt from an expert in education. In that connexion, a short series of lectures for clinical teachers had been conducted two or three years previously by the Melbourne Permanent Post-Graduate Committee. The lecturer was Professor G. S.

Browne, Professor of Education in the University of Melbourne. Dr. Woodruff said that not only was the series fascinating in itself, but he thought that the result had been seen in at least a temporary improvement in the quality of clinical teaching. There was, however, need for repetition of instruction of that sort. Dr. Woodruff urged that a similar opportunity to learn something of modern educational methods as applied to the teaching of medical subjects might be arranged in Adelaide.

A MEETING of the New South Wales Branch of the British Medical Association was held at the Royal Alexandra Hospital for Children, Camperdown, on April 18, 1951. The meeting took the form of a series of clinical demonstrations by members of the honorary medical and surgical staffs of the hospital. Parts of this report appeared in the issues of May 26 and June 2, 1951.

Ruptured Spleen.

DR. C. J. H. GIBSON presented a boy, aged eight years, who, in December, 1950, had fallen from a low iron gate, striking the lower part of his thorax with his full weight in the fall. When examined he was in great distress with distended abdomen, a thoracic type of breathing, and much tenderness and guarding over the lower ribs on the left side, the left hypochondrium and the left loin. No shifting dulness was elicited. Splenectomy was performed with complete recovery.

Retroperitoneal Lymphangiomatous Cyst.

Dr. Gibson's second patient was a boy, aged five years, who had the history that at about 10 a.m., whilst he was in school, he developed a pain in the abdomen. Soon afterwards he vomited. The pain persisted and was still present when he was examined at the Royal Alexandra Hospital for Children about two hours later. On further questioning it was elicited that another boy had jumped on his "stomach" about 9 a.m. His bowels had been open earlier in the morning. There were no urinary signs and symptoms. He looked very ill and pale. His tongue was furred and brown and his breath was fœtid. His abdomen moved only slightly with respiration, and there was generalized tenderness with the point of maximum intensity in the left iliac fossa, as well as moderate generalized guarding. No other abnormalities were found. The most likely diagnosis was considered to be either acute appendicitis with peritonitis or a ruptured viscus. The story of the injury to his abdomen was somewhat vague. Owing to the uncertainty in diagnosis, a right paramedian incision was made. As soon as the peritoneal cavity was opened a fair quantity of greenish, thin pus came through the wound. When that was removed a large, reddish-purple cystic mass was found underlying the wound. The mass was traced up under the left subcostal margin. It was not attached to the kidney, but appeared to be mainly retroperitoneal and bulging into the peritoneal cavity. About one pint of blood-stained fluid was aspirated from the cyst. It was impossible to remove the entire cyst as the patient's condition was not satisfactory, but about half the cyst wall was excised and the area covered with peritoneum. The cyst was drained through a stab wound and the abdomen closed in layers. With suitable post-operative treatment the child had remained well up till the time of the meeting, which was fourteen days after his operation. The cyst had proved to be a lymphangiomatous cyst into which there had been a hæmorrhage.

Burn Contractures of the Hand.

DR. E. S. STUCKEY presented a boy, aged nine years, who in July, 1950, had fallen onto a radiator, burning both hands. After healing had taken place the scars gradually contracted until extension of the fingers was seriously interfered with. At operation on January 31, 1951, the scars on the palmar surfaces of the second to the fifth fingers on the right hand had been excised. That was followed by a split-skin graft to the third and fourth fingers and a "Z"-shaped plastic graft to the second and fifth fingers. The fingers were fixed in extension by being bound to a plaster slab. After three weeks, when the grafts had taken well, movement was begun and gradually restored by physiotherapy, the splint being left off for longer periods each few days. The patient still wore the splint at night, but the result so far was very good. Dr. Stuckey said that the patient's condition was to be contrasted with a similar, though more extensive, condition in which repair had been effected with a large tube-graft from the abdomen. Part of the graft, however, had sloughed, and the dressing could not be taken down for presentation at the meeting.

Hirschsprung's Disease.

Dr. Stuckey with DR. F. N. STREET then presented a boy, aged nine years, who had been suffering from constipation and distended abdomen since birth. It was stated that three weeks after the birth of the child the mother had noticed that his abdomen was swollen and he was suffering from pain. He would not take the breast well. He was first brought to the Royal Alexandra Hospital for Children in January, 1942, when he was aged two months. X-ray examination and spinal anæsthesia at that time confirmed the diagnosis of Hirschsprung's disease, and left-sided and right-sided lumbar sympathectomy had been carried out, although the extent was not stated in the hospital records. Little good had resulted, and the child had been discharged from hospital in May, 1942, still having daily bowel washouts. He had led a "bowel washout existence" ever since, very seldom passing a small motion naturally. His abdomen had remained distended. He was admitted to hospital again in February, 1951, and laparotomy was performed. The large dilated colon was deflated, and a loop of transverse colon was brought out in the upper left quadrant of the abdomen. The colostomy was opened the next day and had worked well since. Frequent colonic lavages of the distal segment had been performed since operation. At the time of the meeting his abdomen was reasonably flat and he had put on seven and a half pounds in weight since his admission to hospital. Although he was very well, his convalescence had been upset by a small atelectasis occurring in the lower lobe of the left lung, which was still resistant to treatment. When that had cleared up he would be submitted to recto-sigmoidectomy of the contracted segment.

Dr. Stuckey then presented a girl, aged twelve years, who had been suffering from constipation and abdominal distension since birth. She had also had vomiting attacks since the age of five or six years. She had been first referred to the Royal Alexandra Hospital for Children when four years old. At that time a diagnosis of Hirschsprung's disease was confirmed, and left followed by right lumbar sympathectomy was performed, the extent not being stated in the hospital records. After that she was fairly well for a year, but constipation and distension gradually increased again. She had an enema every second week, but as her distension increased between washouts she developed vomiting attacks which the washouts relieved. She was readmitted to hospital in February, 1951, and laparotomy was performed. The distended colon was deflated as much as possible, and a loop of transverse colon was exteriorized in the upper left quadrant of the abdomen. The colostomy was opened on the following day and worked well. The distal segment was cleared of fæces by repeated lavages. The patient was awaiting the second stage of recto-sigmoidectomy.

Orthopædic Patients.

DR. L. MACDONALD showed a child, aged two and a half years, who had been brought to the hospital in June, 1948, because of neck stiffness which had followed a fall on the head on the previous day. X-ray examination on the child's admission to hospital showed definite forward subluxation of the second cervical vertebra on the third. There was no evidence of cord pressure. The subluxation was readily reduced by head traction and extension, and a plaster cast was applied maintaining this position. After six months of immobilization with X-ray confirmation of reduction, retentive apparatus was discarded. Forward displacement of the second cervical vertebra on the third then recurred. It was found necessary to continue to hold the head in a position of extension for eighteen months before stability was achieved. After removal of the splint full movement of the cervical spine was rapidly regained and the alignment remained normal. Dr. Macdonald remarked that subluxation of that type was not uncommon following head injury in small children. A long period of immobilization was necessary in all cases. Plaster casts were cumbersome, and if applied to a young child would preclude walking. However, a light Thomas back support with head extension piece and skeleton wire collar had proved a satisfactory appliance.

Dr. Macdonald's second patient, a girl, aged seven months, had been brought to the orthopædic clinic in March, 1947, because of bowing of the left tibia. The deformity had been noticed shortly after birth, and the alignment had not improved with growth. Examination of the child revealed considerable bowing of the left tibia with maximum convexity at the junction of the middle and lower thirds. There was no shortening of the leg, but slight underdevelopment of the calf muscles was noted. X-ray examination showed pronounced lateral bowing of the left tibia at

the junction of the middle and lower thirds. At that point, the shaft of the bone was constricted, the medullary cavity was ill-defined, and there was some sclerosis. It was evident that the condition was a congenital anomaly which had narrowly escaped being a pseudarthrosis. Splintage was instituted in an attempt to obtain gradual correction of the alignment, but over the subsequent six months there was little change in her condition. A supporting splint was applied when the child commenced to walk at the age of fifteen months. In June, 1950, the child fell and sustained a fracture of the left tibia at the site of bowing. End-to-end apposition was maintained and a plaster cast was applied without use of anæsthesia. In spite of adequate immobilization for ten months non-union had persisted. Dr. Macdonald said that some form of bone graft would be required, but it was notoriously difficult to obtain union in such cases, and in early childhood failure was the rule rather than the exception. All cases of unilateral tibial bowing in infants should be regarded with suspicion. Most were allied to congenital pseudarthrosis, and osteoclasis or osteotomy should never be performed. Treatment should aim at protection of the bone from stress. If fracture was avoided most children would develop satisfactory alignment in later childhood.

Dr. Macdonald's third patient, a boy, aged two months, had been admitted to the Royal Alexandra Hospital for Children in April, 1950, because of feeding difficulties and deformities of the arms and legs. The patient was then a puny infant with all the characteristics of arachnodactyly—hypotonicity of the muscles, which might suggest *amyotonia congenita*, deformity of the head, prominent forehead and increased width between the eyes, and great increase in the length of the long bones with particularly long narrow feet and hands. In addition, the infant had flexion contractures of the wrists, hips and knees, and the feet were in a position of pronounced calcaneus. Dr. Macdonald said that the child's general condition had improved greatly, and the postural deformities had been corrected by splintage. The congenital skeletal changes were very evident, and it appeared that there was some degree of mental impairment.

Dr. Macdonald's last patient was a boy, aged five years, who had been brought to the medical out-patient department at the hospital because he was backward in walking. He had been breast fed to the age of seventeen months, though some solid foods had been given at the age of fourteen months. He had had no additional vitamin therapy. He had pronounced tibial bowing and other stigmata of rickets. Splintage was instituted, and he was given massive vitamin dosage without response. He was admitted to hospital in April, 1951, for operative correction of the *genu varum*. Dr. H. R. Sear had reviewed X-ray pictures of the skull, pelvis and long bones taken over a period of three years and had reported that the bone changes were typically those of rickets. There was nothing to suggest chondrodystrophy or other congenital bone dystrophy. Dr. Sear considered that the fact that those changes had persisted and had not improved as a result of therapy would seem to indicate that the condition belonged to the rare type described originally by McCune as refractory rickets, and later by Albright as vitamin *D* resistant rickets.

Long-Standing Bronchial Obstruction due to Foreign Body.

DR. N. H. MEACLE presented a girl, aged three and a half years, who had been admitted to hospital on March 16, 1951, with a history that she had been ill since November, 1950, when she began to suffer from cough with sputum and fever. The X-ray appearances of her chest at that time had been suggestive of pneumonia, and she had been treated with penicillin with some improvement. However, the cough persisted, often occurring in paroxysms, and X-ray examination on March 4, 1951, had shown collapse of the right middle lobe and emphysema of the lower lobe of the right lung. There was no history of inhalation of a foreign body. Physical examination of the child revealed that she was well nourished and had a loose cough. There was diminished movement of her chest at the base of her right lung. The apex beat was palpable in the fourth left intercostal space in the nipple line. The trachea was slightly deviated to the right. The percussion note was slightly impaired at the base of the right lung with diminished air entry at the base of the right lung. Otherwise there was no abnormality. X-ray examination on March 18 revealed dulness in the region of the right lower lobe suggestive of consolidation or atelectasis. Bronchoscopic examination on the same day revealed that the left bronchus was clear, but the right lower lobe bronchus appeared to be occluded. Fragments of a foreign body, which appeared to be peanut, were removed, and pus was aspirated. X-ray examination on the following day revealed that the lower lobe of the right lung was much clearer, but there was still some dulness suggesting patchy consolidation or secretion. Culture of material removed at bronchoscopic examination yielded no growth. Clinical examination showed increased air entry at the base of the right lung, although the percussion note was still dull. Penicillin therapy and postural drainage were instituted. Further X-ray examination on March 22 revealed that the patchy consolidation at the base of the right lung had increased in extent. The child's general condition continued to improve. Subsequent X-ray examination revealed further aeration of the lower lobe of the right lung, but there was still some considerable exaggeration of pulmonary markings and bronchiectasis could not be excluded. Bronchoscopy was again performed on April 3, and a small foreign body was removed from the right lower lobe bronchus. No pus was aspirated on that occasion. Three days later there was still some congestion to be seen radiologically in the lower lobe of the right lung, but no evidence of atelectasis. Clinically the chest appeared normal. On April 10 bronchoscopy was again performed, and another piece of foreign body was removed but no pus aspirated. A bronchogram prepared at the same time showed no abnormality of the bronchial tree.

MEDICO-POLITICAL.

THE following statement is published at the request of the Medical Secretary of the New South Wales Branch of the British Medical Association.

Friendly Society Contract Practice.

The purpose of this statement is to give a résumé of the events over recent years which led to the termination of the capitation method of payment for medical services to members of friendly society lodges.

It is fully realized that the system of friendly society contract medical practice had its advantages both to the medical practitioner and to the friendly society members, but it had also its disadvantages. There is little need to recapitulate these, for they were fully set out in a statement issued to members of the New South Wales Branch on September 5, 1950. That statement was accepted by the friendly societies as being a fair and reasonable summary of the pros and cons of the matter.

Whatever system of providing medical services prevails, there can be little hope of its succeeding unless the terms and conditions of the service are satisfactory to both parties. As far as the medical profession was concerned, it was felt over recent years that the terms and conditions of the Common Form of Agreement were unsatisfactory. This feeling was engendered to a large extent by the inadequate payment for the services and to a greater extent by the inability of, and what was virtually a refusal on the part of, the friendly societies to police the income limit.

As far back as early in 1940, the Federal Council of the Friendly Societies asked the Federal Council of the British Medical Association in Australia to agree to the introduction of a Federal Common Form of Agreement in order to have friendly society contract practice placed on a uniform basis throughout Australia. Every attempt was made by the Federal Council of the British Medical Association in Australia to bring into operation such an agreement, but at the end of six years the friendly societies intimated that they did not wish to proceed with the matter. In this very action can be seen the failure of the friendly societies to appreciate the need to have this form of medical service placed on a sound and satisfactory basis.

In a communication under date of June 27, 1946, the Friendly Societies Association of New South Wales referred to a discussion which it had had with representatives of the Council of the New South Wales Branch some few days previously, in which the members of its executive had "expressed their extreme concern at the possible effect the new medical benefits organization (now the Medical Benefits Fund of Australia) would have upon the present friendly societies contract practice".

The communication then asked:

> Will the British Medical Association be prepared to discuss the immediate introduction of a new agreement with the friendly societies in New South Wales. It being understood that any agreement arrived at will be a temporary one and be superseded by the Federal Common Form of Agreement when such is finalized. The suggested Common Form of Agreement to be taken as a basis for discussion.

It was shortly after receipt of the communication from the Friendly Societies Association of New South Wales that the friendly societies of Australia decided against the adoption of a Federal Common Form of Agreement, but the Branch Council decided to proceed with a new agreement based on the proposals already made for a Federal Common Form of Agreement.

On October 27, 1947, a draft of the proposed agreement was forwarded to the Friendly Societies Association. In the letter accompanying the draft particular reference was made to Clause 13 dealing with the annual adjustment of the capitation rate. It was pointed out that under the clause an adjustment would take place in July, 1948, and that it would therefore be necessary to determine the "nominal wage" for the year ending December 31, 1947, and to use the "nominal wage" for the year ended December 31, 1946, as the basis on which the adjustment would be made. The letter also stated that it was desired that the agreement should come into force on January 1, 1948.

A reply was received to the effect that the Friendly Societies Association was prepared to accept and sign the agreement submitted upon condition that it was interpreted in the light of all the discussions over the past years. In other words, they stated, they would not accept the variations detailed in the communication as they were contrary to the principles previously discussed. The friendly societies were asked to inform the Council of the manner in which it was considered that the proposed agreement departed from the principles previously discussed. One of the main points concerned the question of the income limit, but an amicable agreement was reached on this matter as with other matters of minor importance. With regard to the annual adjustment of the capitation rate the Friendly Societies Association advised in a reply under date of November 7, 1947, that it had "no comment at this stage regarding this matter", nor did it make any further comment at a conference subsequently held on November 13, 1947, to discuss the income limit and other matters.

Finally, on November 28, 1947, the Friendly Societies Association advised of its acceptance of the draft agreement with the amendments in regard to income limit and other minor matters. The agreement then came into operation on January 1, 1948.

As indicated previously, the Council had advised the Friendly Societies Association that the rates should be adjusted on July 1, 1948. On July 19, 1948, no advice having been received from the Friendly Societies Association of any intention to bring about an adjustment, a communication was addressed to it setting out the manner in which the adjustment should be made. This method, however, was not acceptable to the Friendly Societies Association of New South Wales, and under date of August 4, 1948, it submitted another method in accordance with its interpretation of Clause 13 of the Common Form of Agreement. In the final clause of its letter it stated:

> If the basis of calculation as set out by my association is acceptable, it will be of great assistance in having the necessary adjustment made with the current accounts between the medical officers and lodges, and expedite the implementation of this essential clause of the agreement.

The words "in having the necessary adjustments made with the current accounts" indicated to the Council, without the slightest doubt, that the Friendly Societies Association realized that the adjustment should be made from July 1, 1948. The only difference of opinion therefore appeared to concern the method to be adopted.

On September 17, 1948, following legal advice that the method adopted by the Council for the adjustment of the rate was correct, the Council advised the Friendly Societies Association that it could not accept its submission, and asked whether it would be prepared to submit the matter to an arbitrator to be mutually agreed upon, each party to abide by the arbitrator's decision and the expense incurred therein to be borne equally by both parties. It was indeed a surprise to the Council when, in reply to this request, the Friendly Societies Association advised that the correspondence between the two associations had been submitted for legal advice and that it had been informed that the proper construction of the agreement was that no adjustment of the capitation fee was to be made as from July 1, 1948, and that such adjustment would only be made when the machinery required by Clause 13 had come into being and that for the year 1948-1949 at least, the capitation fee would remain at the figures agreed upon, as set out in the agreement.

The letter of August 4, 1948, from the Friendly Societies Association had admitted that the "current accounts" should be adjusted. The Council was of the same opinion. In other words the spirit of the agreement was that there should be an adjustment made on July 1, 1948. Further legal opinion from King's Counsel indicated that the Council was correct in its view that the adjustment should be made on July 1, 1948.

On December 9, 1948, a conference was held with the Friendly Societies Association, when the representatives of this organization present at the conference indicated that they were prepared to recommend strongly an adjustment in the capitation rate as from July 1, 1949, the method of making the adjustment to be that previously submitted by them. No further advice was received in regard to what happened to this recommendation, and on December 22, 1949, the Council again wrote to the Friendly Societies Association asking it to give consideration to submitting to arbitration the matters of: (i) the commencing date of the adjustment in accordance with Clause 13 of the Common Form of Agreement; (ii) the method of computing the adjustment.

It was further asked that if the Friendly Societies Association could not see its way clear to accept arbitration, it give consideration to joining with the Council in making the necessary arrangements for presentation of a case to court.

On February 10, 1949, the Friendly Societies Association advised that it felt that there was nothing to be gained in submitting to arbitration the matters mentioned in the Council's letter of December 22, 1948, and that it was disappointed that any differences between the associations could not have been settled in conference. It had no objection to the matter being decided by the court.

Steps were accordingly taken to prepare for the presentation of the case to court. Members of the Illawarra Suburbs Medical Association were requested to render accounts to the lodges based on capitation rates determined in accordance with the Council's interpretation of Clause 13. One member of this local association, Dr. G. W. Ashby, agreed to act as nominal plaintiff, and a writ was issued on April 5, 1950, the case to be presented to the Full Court. The drafting of the case was undertaken by the counsel for both parties, but it was a matter for regret that these preparations had not reached finality by the end of 1950, when members advised their lodges that they would be terminating their agreements. For the delay the Council and its legal representatives can accept only the slightest responsibility.

On January 9, 1951, the Council decided that no good purpose could be served in having Clause 13 interpreted by the court in view of the fact that the agreements between medical practitioners and friendly societies would terminate on March 31, 1951. The legal representatives of the association advised the legal representatives of the Friendly Societies Association of New South Wales to this effect. In the course of their letter they stated:

> The Council maintains that the Friendly Societies Association of New South Wales failed to honour the spirit of the agreement in regard to the manner in which the capitation rate should have been increased and it maintains further that the capitation rate provided for in the agreement should have been varied from time to time in the manner contended for by it.

The letter further stated:

> The Friendly Societies Association of New South Wales had refused arbitration in the matter. Dr. Ashby's action was accordingly intended by our respective clients to be in the nature of a test case so that medical practitioners and trustees of friendly society lodges would know where they stood with regard to the variations in the capitation rate provided for by Clause 13 of the agreement, and in these circumstances we suggest that the discontinuance of Dr. Ashby's action be on the basis that each party pays its own cost of the proceedings.

The suggestion contained in these last few lines were adopted by the Friendly Societies Association of New South Wales.

It is to be noted that the Friendly Societies Association of New South Wales notified the Council that, without prejudice, it was prepared to agree upon an adjustment of the capitation rate as from July 1, 1950. The Council intimated that it was prepared to agree to the amounts suggested being paid in respect of the year commencing on July 1, 1950, so long as it was agreed that such payments were accepted subject and without prejudice to the right of medical officers to have such further adjustments made, both in respect of the year commencing July 1, 1950, and in respect of the two preceding years, as may be necessary to provide for payment to medical officers of the full amount of the rates which are held by the court to be payable to them under the agreement.

It is of particular interest to note that the method adopted in the adjustment of the rates was that of the Council. Its application, however, in 1950 meant that the rates proposed were far below what they should have been had the same method been applied in 1948, two years earlier, as requested by the Council.

So far this statement has dealt only with Clause 13 and its interpretation. It is as well that brief mention should be made of other matters.

In the Common Form of Agreement as eventually agreed upon at the end of 1947, there appears at the end of the agreement the following paragraph:

> Where the supply of medicine is provided for (see Clause 7(a)) the minimum charge for such is eighteen shillings per member *per annum* in addition to the rate for attendance.

This clause was unequivocal in what it stated. There was no doubt as to its interpretation, and naturally the Council was concerned when it received advice that medical officers who undertook the dispensing of medicine were not paid in accordance with this clause. One interpretation of the clause by the friendly societies' representatives was that the rate of 18s. would apply only when a chemist was not available in the town, and that if a chemist was available within a distance of two miles the medical officer supplying the service would be paid at the rate payable to chemists. This is but another example of the unwillingness of the Friendly Societies Association to comply with the terms of the agreement.

Reference has already been made in the early part of this statement to the failure of the friendly societies to police the income limit, one of the prime causes of the profession's dissatisfaction with contract practice. The Common Form of Agreement provided that in the case of any person seeking to become entitled to medical benefits such person should hand to the medical officer a (further) written declaration stating that his income was not in excess of the limit prescribed by Clause 29.

It was obviously an obligation on the part of the Friendly Societies Association to print and distribute these forms amongst its lodges. The Friendly Societies Association intimated, however, that it was without the facilities for the printing of the forms. Later it stated

> that this association is of the opinion that the supply of forms, to be provided for candidates with regard to salary allowances, is a matter for the medical officers.

It also stated that the medical officer was in a favoured position in estimating the probable income of the applicant and could rightly demand the completion of the necessary declaration.

Finally, the Council was obliged to inform the Friendly Societies Association that unless the friendly societies provided the forms, no new lodge members would be accepted. Reports obtained from individual medical officers indicated, however, that even when the forms were printed, it was uncommon for them to be presented to the medical officer.

The failure of the Friendly Societies Association of New South Wales to honour the spirit of the Common Form of Agreement, the general dissatisfaction of the profession in New South Wales with friendly society contract practice and its desire for its replacement with a fee-for-service method of payment left no alternative to the Council but to adopt the policy of the Federal Council for the replacement of the capitation system by a fee-for-service system. Accordingly at the end of 1950, members advised their lodges, to whom they had been attached as medical officers, that they would terminate their agreements on March 31, 1951.

Correspondence.

"PRINICIPLES OF OPHTHALMOLOGY."

SIR: May I comment on the review of "Principles of Ophthalmology" which appeared in the journal on March 17, 1951.

It is manifest that the reviewer has overlooked the prologue as well as the epilogue, or otherwise he could not have failed to note the purpose of the work, the coordination of conditions in the eye with similar tissues and analogous situations elsewhere in the animal kingdom. In addition it would appear that he has skipped most of the intervening pages, or otherwise he would not ascribe views that find no place in the work.

He concludes, "this is a volume for the critical ophthalmologist". I suggest that no great acumen is required to recognize the incongruities associated with the ciliary muscle and the chorioid. The ciliary muscle is expected to function with only one nerve, while all non-striped muscle, including the *sphincter* and *dilator pupillæ*, are actuated by two nerves. The anterior segment of the chorioid is equally singular, for it is the only vascular structure that is expected to withstand a constant stress without ill effects.

These and similar problems are elucidated when the tissues composing the eye cease to be regarded as a law unto themselves and are governed by the same principles as obtain throughout Nature.

Yours, etc.,

15 The Ropewalk,
Nottingham,
England.
May 18, 1951.

THOMSON HENDERSON.

SOME OBSERVATIONS ON THE POLIOMYELITIS EPIDEMIC AT STANTHORPE.

SIR: Your correspondent, Dr. R. L. Green, writing in the journal of May 5, has barely given enough clinical details in his cases for one to form any opinion as to the relationship of the patients' illnesses to the previous paralyses and gastro-intestinal upsets occurring in poultry. Surely, it would be better, in the case which is described in rather more detail, to diagnose post-measles encephalitis rather than indulge in the luxury of a triple diagnosis.

Dr. Green's description of the fowls' illnesses does appear to be consistent with Newcastle disease of fowl, which is said to spread not only from the affected birds to man, but also from man to man and affects the respiratory, gastro-intestinal and central nervous systems of fowls.

I am suggesting that the cases which have been described, apart from Case I, may possibly have been cases of encephalomyelitis spread by a neurotropic virus associated with Newcastle disease, the vector being the mosquito.

Professor Burnet, who has worked on Newcastle disease of fowl, may be able to give his views regarding this possibility.

Yours, etc.,

101 Wentworth Street,
Blackheath,
New South Wales.
May 6, 1951.

R. M. HAINS.

Reference.

"Virus and Rickettsial Diseases", by Bedson, MacCallum *et alii*, 1950.

The Royal Australasian College of Physicians.

THIRTEENTH ANNUAL MEETING.

THE thirteenth annual meeting of The Royal Australasian College of Physicians was held in Sydney from Wednesday to Friday, April 11 to 13, 1951.

At the meeting of the general body of Fellows, two Fellows were elected under the provisions of article 40, which provides for the admission to Fellowship of persons distinguished in any branch of medical science or internal medicine. Those elected under this article were Professor Andrew Arthur Abbie, M.B., B.S., B.Sc. (Syd.), Ph.D. (Lond.), M.D. (Syd.), D.Sc. (Syd.) and D.Sc. (Adel.), and Dr. Hilda Josephine Gardner, M.B., B.S. (Adel.).

The following members were elected by the general body of Fellows to Fellowship of the College: Dr. R. M. Biggins (Victoria), Dr. Innes A. Brodziak (New South Wales), Dr. J. Eric Clarke (Victoria), Dr. E. M. A. Day (New South Wales), Dr. J. L. Frew (Victoria), Dr. W. E. George (New South Wales), Dr. W. E. Henley (New Zealand), Dr. J. F.

Hughes (Victoria), Dr. Henry McLorinan (Victoria), Dr. J. H. Young (Western Australia).

The following candidates who were successful at examinations held in Australia and New Zealand were admitted to membership of the College on April 11, 1951: Dr. O. S. Hirschfeld, Dr. A. F. Knyvett, Dr. J. A. Nye and Dr. J. D. Tange, of Queensland; Dr. J. C. English, Dr. R. M. Gibson and Dr. W. A. Murphy, of New South Wales; Dr. W. S. Rickards, of Victoria; Dr. R. Hecker and Dr. K. V. Sanderson, of South Australia; Dr. M. J. S. Marshall, of Western Australia; Dr. R. A. Melick, of Tasmania; Dr. E. D. Burnard, Dr. S. C. Hawes and Dr. E. M. McLachlan, of New Zealand.

ORDINARY MEETING, 1951.

THE ordinary meeting of the College in 1951 will take place in Perth from October 15 to 19, 1951.

EXAMINATION FOR MEMBERSHIP.

AN examination for membership of The Royal Australasian College of Physicians will take place in September-October, 1951. The written examination will be held on Saturday, September 1, in capital cities of the Commonwealth where candidates are offering. The clinical examination will take place in Melbourne in the week ending October 13.

Only those candidates whose answers in the written examination have attained a satisfactory standard will be asked by the Censor-in-Chief to proceed to the clinical examination.

Applications to appear before the Board of Censors should be made in the prescribed form and must be in the hands of the Honorary Secretary of the College not later than Saturday, August 4, 1951. Application forms are obtainable from the Honorary Secretary.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Course in Pædiatrics.

THE Post-Graduate Committee in Medicine in the University of Sydney will conduct a course in pædiatrics, under the supervision of Professor Lorimer Dods, in the lecture hall of the Royal Alexandra Hospital for Children, Camperdown, for one week beginning August 13, 1951.

The fee for attendance will be £3 3s., and those wishing to enrol are requested to communicate with the Course Secretary of the Committee, 131 Macquarie Street, Sydney, before July 16, 1951, which is the closing date for applications. Telephones: BU 5238, BW 7483.

The programme will be as follows:

Monday, August 13: 9.30 a.m., "Pink Disease", Dr. D. G. Hamilton; 10.45 a.m., ward rounds, medical registrar; 11.45 a.m., "Antibiotics and Surgery", Dr. T. Y. Nelson; 2 p.m., "Indications for Tonsillectomy", Dr. D. L. Dey; 3.15 p.m., "Common Skin Conditions of Children", Dr. Henry Sharp.

Tuesday, August 14: 9.30 a.m., "Anorexia in Childhood", Dr. D. S. Stuckey; 10.45 a.m., ward rounds, surgical registrar; 11.45 a.m., "Croup and Allied Conditions", Dr. M. L. Edwards; 2 p.m., "Therapeutics I", Dr. Bryan Dowd; 3.15 p.m., "Therapeutics II", Dr. C. W. G. Lee.

Wednesday, August 15: 9.30 a.m., "Subacute Rheumatism", Dr. W. P. MacCallum; 10.45 a.m., "Orthopædic Problems", Dr. R. E. Wherrett; 11.45 a.m., "The Chronic Cough", Dr. D. G. Hamilton; 2 p.m., "Enuresis", Dr. F. N. Street; 3.15 p.m., "Fever and Stiff Neck", Dr. S. G. Bradfield.

Thursday, August 16: 9.30 a.m., "Resuscitation of the Newborn Infant", Dr. Kathleen Winning; 10.45 a.m., ward rounds; 11.45 a.m., "Burns", Dr. J. Steigrad; 2 p.m., "Undescended Testis", Dr. C. J. Gibson; 3.15 p.m., "The Care of the Premature Infant", Dr. Gertrude Geikie.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED MAY 12, 1951.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.[2]	Australian Capital Territory.	Australia.[3]
Ankylostomiasis	*	..	2	..	..	..	..	..	2
Anthrax	*	..	..	..	..	..	..	..	..
Beriberi	*	*	*	*	*	*	..	*	..
Bilharziasis	*	..	..	..	..	..	..	..	..
Cerebro-spinal Meningitis	1	..	1	..	..	..	..	..	2
Cholera	..	..	..	..	..	..	..	..	..
Coastal Fever(*a*)	*	*	*	*	*	*	*	*	..
Dengue	*	*	*	*	*	*	..	*	..
Diarrhœa (Infantile)	..	..	2(2)	..	..	..	..	..	2
Diphtheria	13(3)	3(1)	3(2)	1(1)	7(2)	..	..	..	27
Dysentery (Amœbic)	*	..	..	..	..	..	..	..	..
Dysentery (Bacillary)	*	..	3(3)	..	1	..	..	..	4
Encephalitis Lethargica	..	..	..	..	..	..	..	..	..
Erysipelas	*	*	*	..	*	*	..	..	..
Filariasis	*	..	..	..	..	..	..	..	..
Helminthiasis	*	..	*	*	*	*	*	*	..
Hydatid	*	..	*	*	..	*	*	..	..
Influenza	*	*	*	..	*	*	..	*	..
Lead Poisoning	*	*	..	*	*	*	*	*	..
Leprosy	..	..	..	..	..	..	..	..	..
Malaria(*b*)	*	..	..	..	..	..	..	..	..
Measles	*	*	*	12(8)	*	*	..	..	12
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	29(5)	9(3)	26(8)	14(10)	..	..	..	..	78
Psittacosis	*	..	*	..	*	*	*	*	..
Puerperal Fever	..	..	..	..	..	..	..	..	..
Rubella(*c*)	*	*	..	*	..	*	..	..	..
Scarlet Fever	10(2)	32(26)	7(4)	6(6)	2(2)	1	..	..	58
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	*	..	..	*	*	*	*	*	..
Trachoma	*	..	*	*	1	*	*	*	1
Tuberculosis(*d*)	32(28)	25(18)	4(2)	6(3)	3(2)	6(1)	..	..	76
Typhoid Fever(*e*)	..	..	..	..	1(1)	..	..	..	1
Typhus (Endemic)(*f*)	1	..	..	..	..	..	..	..	1
Undulant Fever	..	..	1(1)	..	..	..	..	..	1
Weil's Disease(*g*)	*	*	1	*	*	*	*	*	1
Whooping Cough	*	*	*	..	*	*	..	1	1
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] The form of this table is taken from the *Official Year Book of the Commonwealth of Australia*, Number 37, 1946–1947. Figures in parentheses are those for the metropolitan area.
[2] Figures not available.
[3] Figures incomplete owing to absence of returns from the Northern Territory.
* Not notifiable.
(*a*) Includes Mossman and Sarina fevers. (*b*) Mainly relapses among servicemen infected overseas. (*c*) Notifiable disease in Queensland in females aged over fourteen years. (*d*) Includes all forms. (*e*) Includes enteric fever, paratyphoid fevers and other Salmonella infections. (*f*) Includes scrub, murine and tick typhus. (*g*) Includes leptospiroses, Weil's and para-Weil's disease.

Friday, August 17: 9.30 a.m., "Abdominal Pain", Dr. E. S. Stuckey; 10.45 a.m., "Demonstration of Intravenous Therapy", Dr. John McDonald; 11.45 a.m., (*a*) "Threadworms", Dr. G. Blaxland, (*b*) "Pertussis", Dr. Bryan Dowd; 2 p.m., "Infant Feeding", Dr. Kathleen Winning; 3.15 p.m., "The Deaf Child", Dr. Patricia Davey.

THE MELBOURNE PERMANENT POST-GRADUATE COMMITTEE.

PROGRAMME FOR JULY.

Course for M.D., Part II, and M.R.A.C.P.

Renal Disorders.

A COURSE in renal disorders, suitable for candidates for the M.D., Part II, and M.R.A.C.P. examinations, which has been arranged by Dr. Leslie Hurley, will be conducted at the Royal Melbourne Hospital at 2 p.m. on Tuesdays and Thursdays, as follows: July 17, "Classification of Nephritis: Albuminuria", Dr. L. Hurley. July 19, "Acute Nephritis", Dr. L. Hurley. July 24, "Subacute Nephritis (Nephrosis-Type 2 Nephritis)", Dr. L. Hurley. July 26, "Essential Hypertension", Dr. J. L. Frew. July 31, "Chronic Nephritis", Dr. J. L. Frew. August 2, "Uræmia", Dr. J. L. Frew.

Enrolments for this course should be made with the Secretary of the Post-Graduate Committee, 394 Albert Street, East Melbourne, as soon as possible. The fee for the course is £3 3s., or 10s. 6d. per lecture.

Obituary.

DUNCAN BUCHANAN.

WE regret to announce the death of Dr. Duncan Buchanan, of Coolamon, which occurred on May 21, 1951, at Wagga.

Notice.

LECTURE ON MARRIAGE GUIDANCE COUNCILS.

DR. CLARA STEWART, O.B.E., Vice-Chairman of the National Marriage Guidance Council of Great Britain, will speak on "The Place of a Marriage Guidance Council in the Community" on Tuesday, June 12, 1951, at 8 p.m., at the Stawell Hall of The Royal Australasian College of Physicians, 145 Macquarie Street, Sydney.

Dr. Stewart has been closely associated with all aspects of marriage guidance work in Great Britain and for several years was honorary secretary of the Leeds Marriage Guidance Council. She is also a member of the executive committee of the Leeds Council of Social Service.

The meeting has been arranged by the Council of Social Service of New South Wales. All interested are invited to attend.

THE ARTHUR WILSON MEMORIAL FUND.

THE following donations have been received for the Arthur Wilson Memorial Fund, which will be devoted to research into problems of childbirth. They are acknowledged with thanks. Donations may be sent to Dr. C. K. Churches, Honorary Treasurer, 122 Flinders Street, Melbourne, C.1, and will be acknowledged in this journal.

Previously acknowledged £1817 2s., Dr. and Mrs. George Simpson £21, Dr. and Mrs. R. J. David Turnbull £21, Dr. W. W. Wilson £10 10s., estate of late Dr. K. McK. Doig £10 10s., Dr. Leonard Lillies £10 10s., Dr. N. T. Hannaford Schafer £10, Dr. Allan A. Ferris £2 2s. Also acknowledged with thanks is the sum of £75 from the Victorian Medical Women's Society, made up as follows: Dr. Alison Mackie £25, Dr. Alice Correll £6 2s., Dr. Winifred Kennan £5 5s., Dr. Ella Macknight £5 5s., Dr. Bruce Scott £5 5s., Dr. Dorothy Synan £5 5s., Dr. Isabel Ireland £5 5s., Dr. Lorna Lloyd-Green £5 5s., Dr. Elizabeth McComas £5 5s., Dr. Mona Blanch £3, Dr. M. Gilchrist £2 2s., Dr. Gladys Hallows £1 1s., Dr. Dixon 7s. 6d., Dr. Joan Marsden 7s. 6d., Dr. Leveson 5s. Total: **£1977 14s.**

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Smithurst, Barry Anthony, M.B., B.S., 1951 (Univ. Sydney), Saint Vincent's Hospital, Darlinghurst.

Vickery, Ronald Burgess, M.B., B.S., 1951 (Univ. Sydney), Marrickville District Hospital, Marrickville.

Cook, Samuel West, M.B., B.S., 1951 (Univ. Sydney), 21 Alexandra Street, Hunter's Hill.

James, George Robert, M.B., B.S., 1951 (Univ. Sydney), 24 Banks Street, Brighton-le-Sands.

Spencer, Terence Edward Thornton, M.B., B.S., 1951 (Univ. Sydney), Moorabinda, Tenterfield, New South Wales.

Lindsell, Charles Kenneth, M.B., B.S., 1950 (Univ. Sydney), 153 Fuller's Road, Chatswood.

Diary for the Month.

JUNE 8.—Queensland Branch, B.M.A.: Council Meeting.
JUNE 8.—Tasmanian Branch, B.M.A.: Council Meeting.
JUNE 12.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JUNE 19.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney)—All contract practice appointments in New South Wales.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federal Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Norseman Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £4 *per annum* within Australia and the British Commonwealth of Nations, and £5 *per annum* within America and foreign countries, payable in advance.